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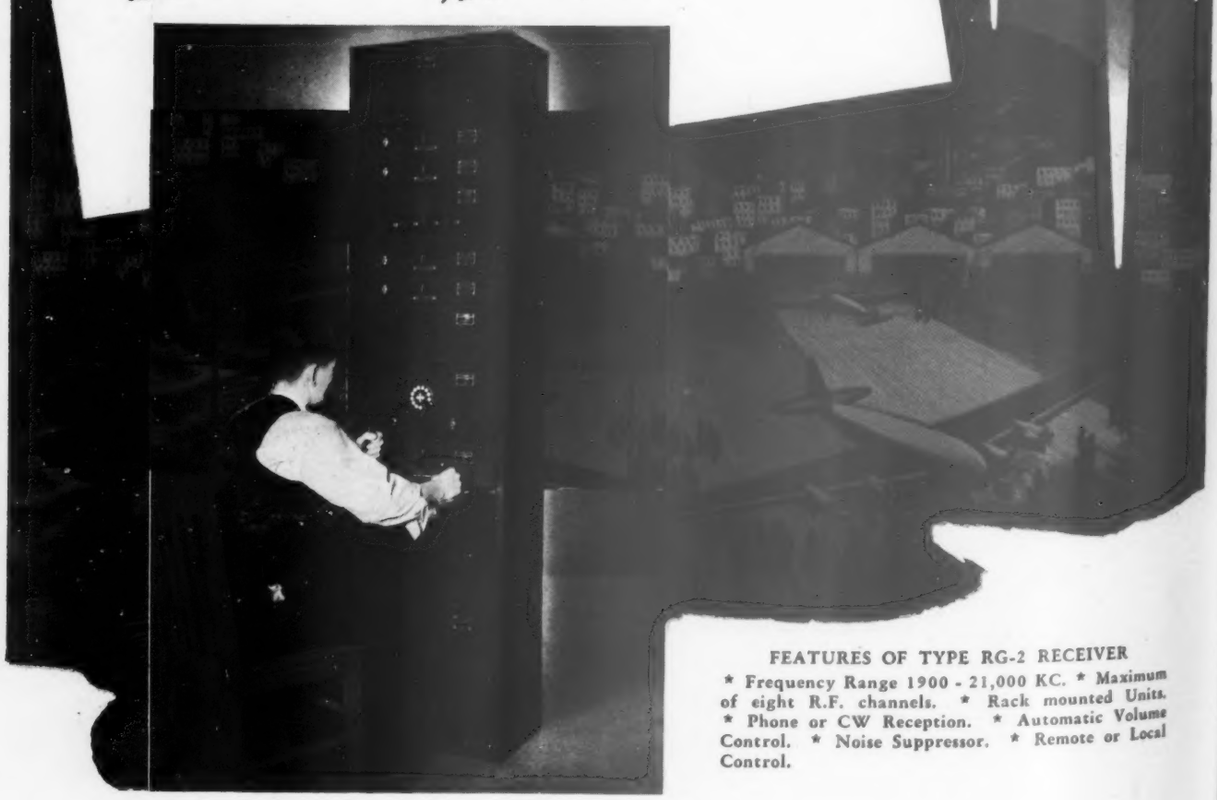

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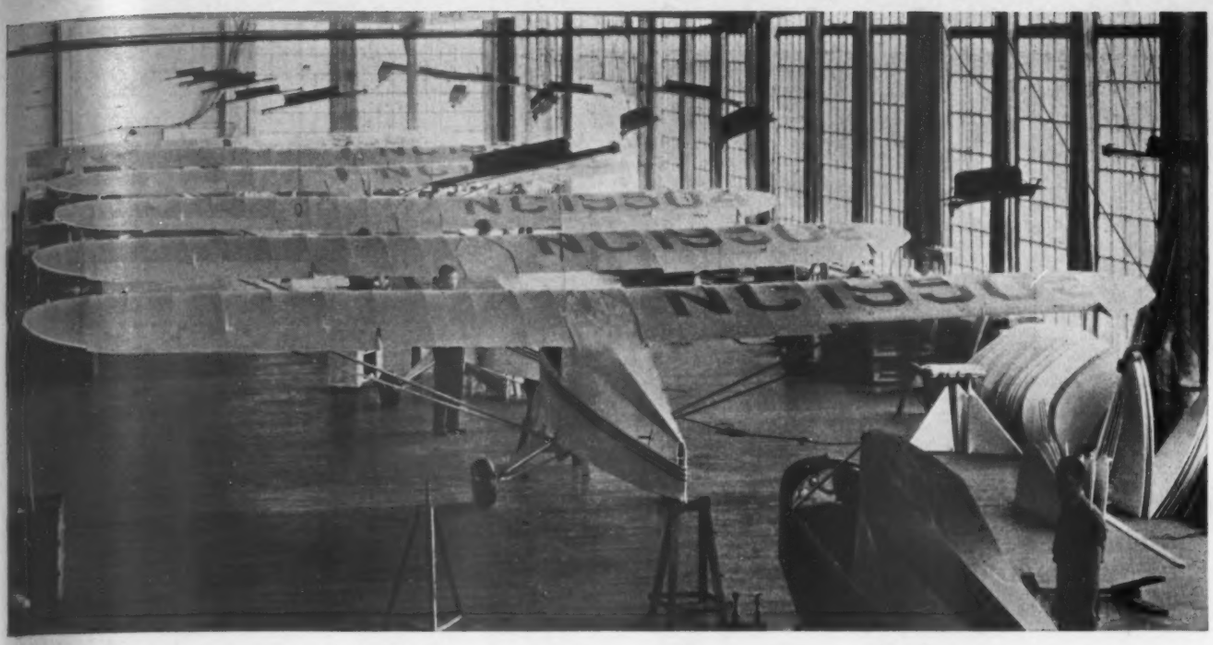

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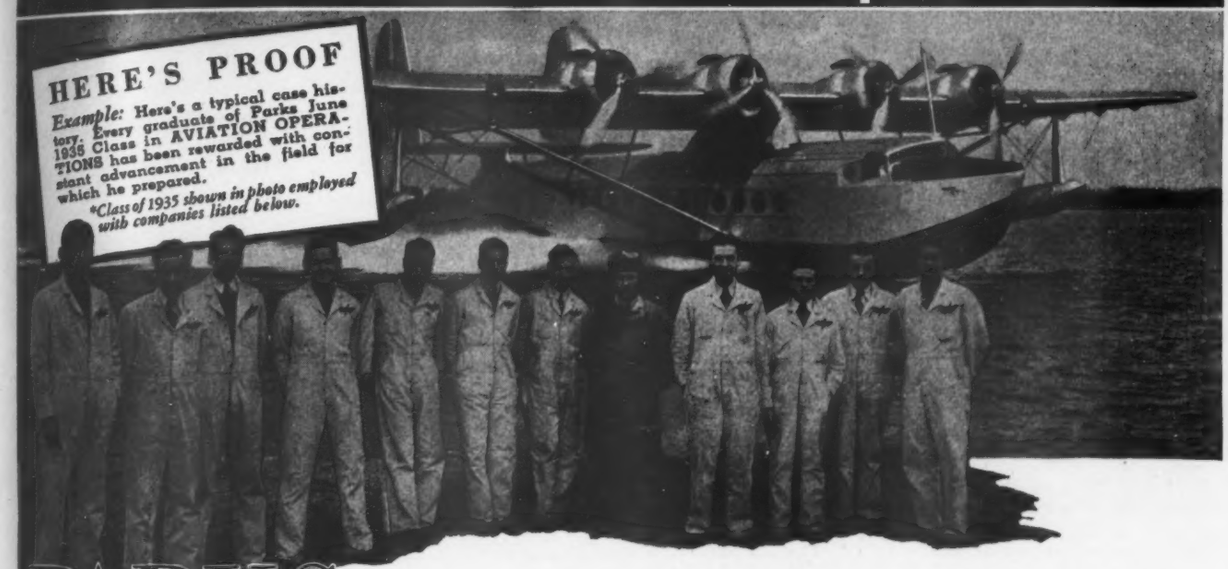
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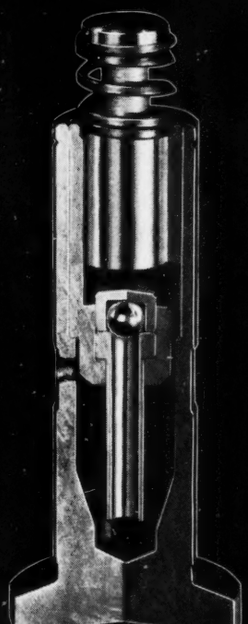

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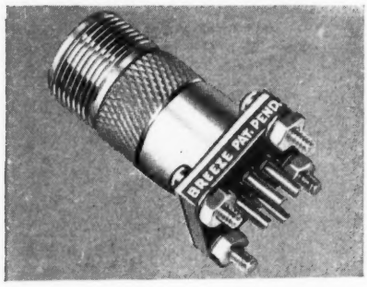

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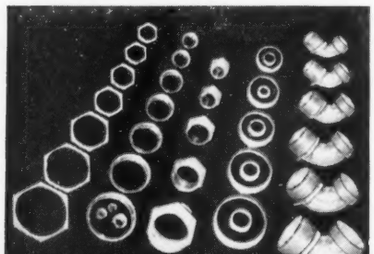

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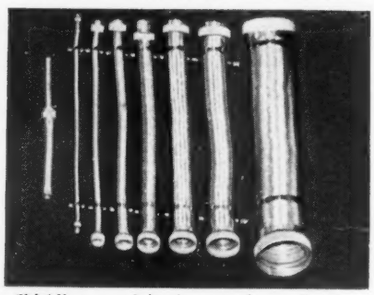

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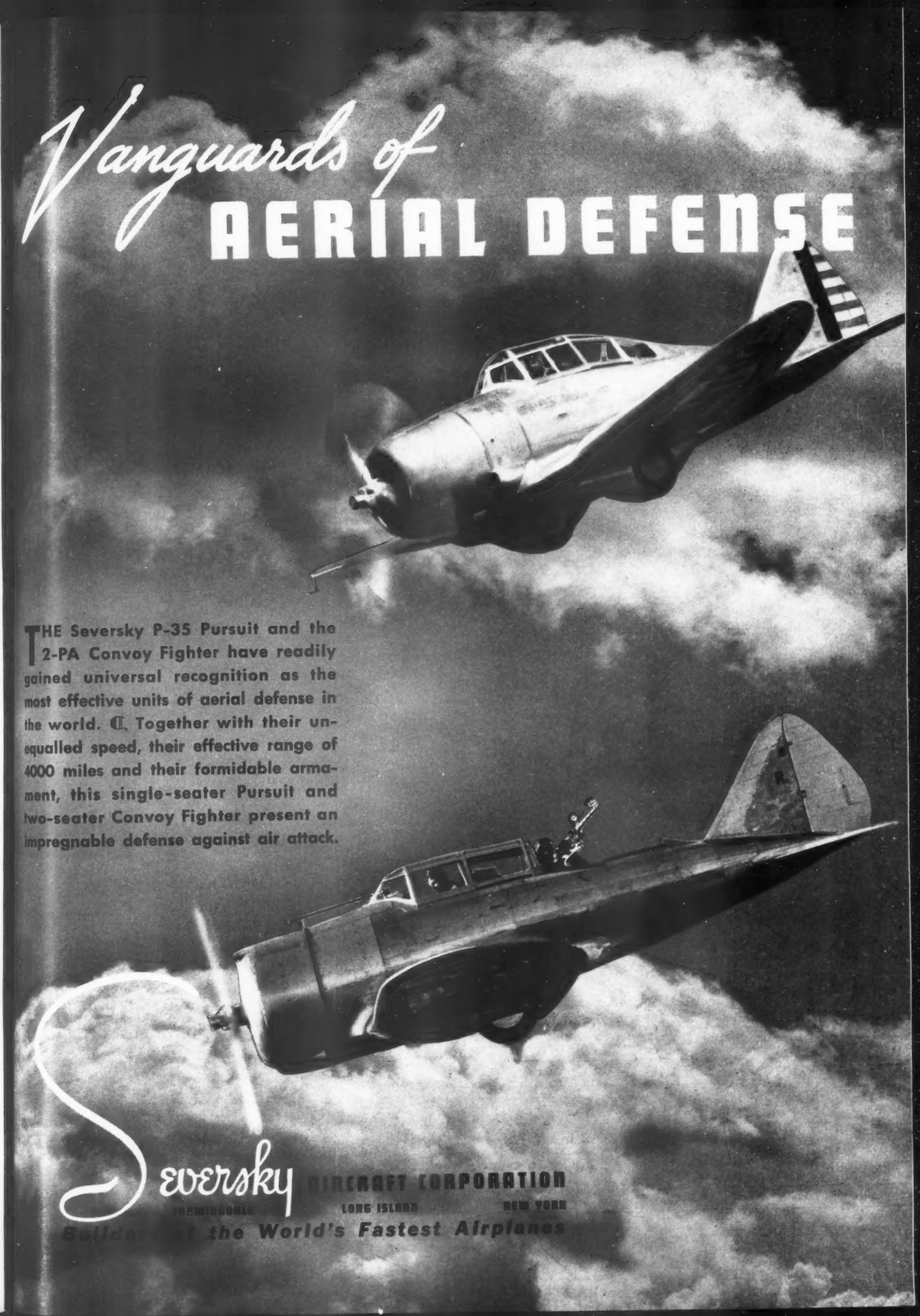
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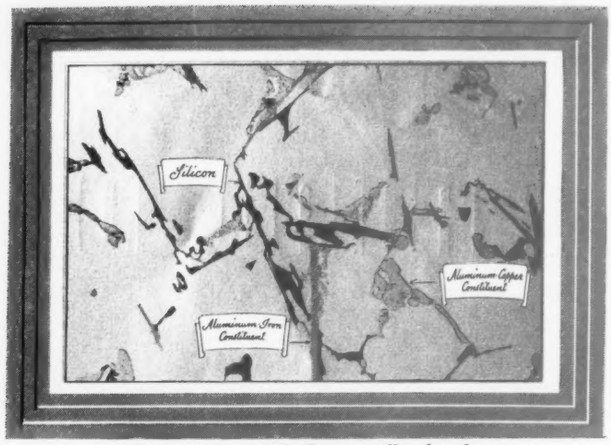


Photograph of a typical Aluminum Alloy, through a microscope to produce a magnification of 500 times.

Useful Alloys of Aluminum Do Not Just Happen

THE WORD *alloy* has become an industrial commonplace, yet the very fact of alloys is one of the significant things in modern industry.

For industry can progress only as its materials improve. The metals, including Aluminum are among aviation's important materials. And alloys are simply metals built to industry's own specifications.

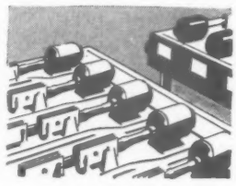
An alloy begins with a metal having certain dominant natural characteristics; additional qualities are developed by deliberate combination with other metals. The result is virtually a new metal, with certain properties greatly improved and with new kinds of usefulness.

Natural characteristics of Aluminum are lightness, resistance to corrosion, and excellent heat conductivity. When aviation needs these intrinsic advantages, coupled with a new set of physical properties, such as greater strength or hardness, research is called upon to develop a new alloy.

The specifications demanded become a definite problem for attack in the laboratory by metallurgists and other scientists who are grounded in the theory and the history of alloy development.

After they have determined the best alloying ingredients and the processing necessary to develop optimum characteristics, the alloy is put through thousands of tests to determine whether the desired qualities have been achieved, and particularly whether the results are uniformly dependable.

The experts in manufacturing have their innings, too. Can the alloy be cast or worked as intended? How does it machine? What of welding? How about surface finish?



It takes men to make an alloy — many men. It takes extensive (and expensive) equipment. And it takes time.

Research has already developed many different alloys of Aluminum, each with its own special combination of useful characteristics. How many more will be needed by aviation, only time can tell. Some we are searching for at this writing, and what we are learning in such study will be helpful in meeting the even stiffer specifications which aviation most certainly will be laying down tomorrow.

This is one of the ways we are accepting our responsibility to aviation and to the general public. ALUMINUM COMPANY OF AMERICA, 2182 Gulf Building, Pittsburgh, Pennsylvania.

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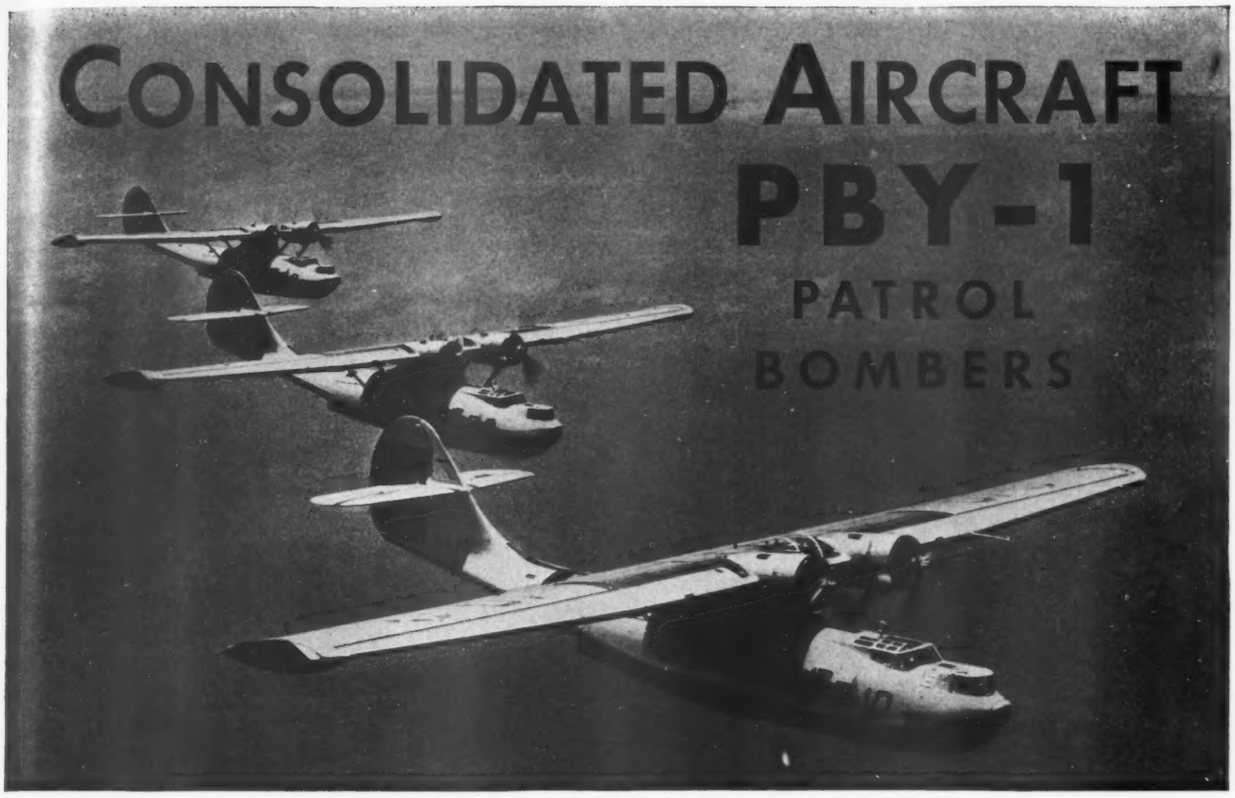

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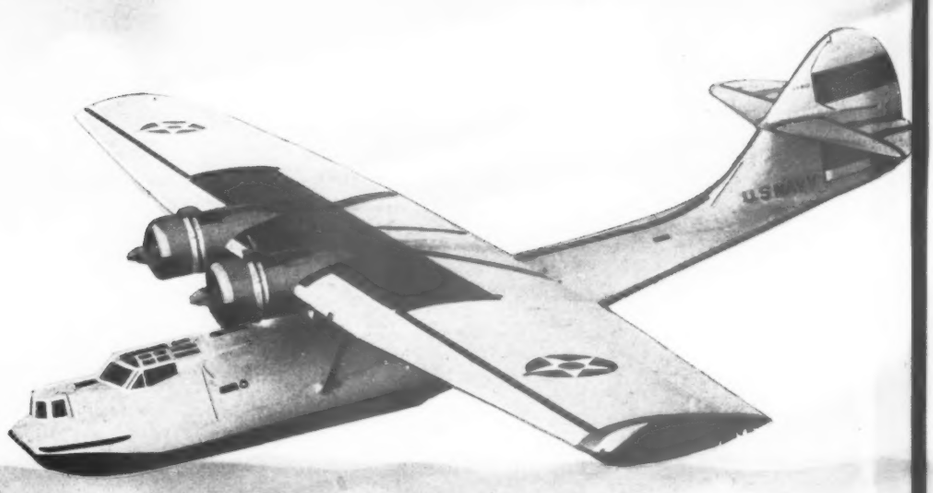

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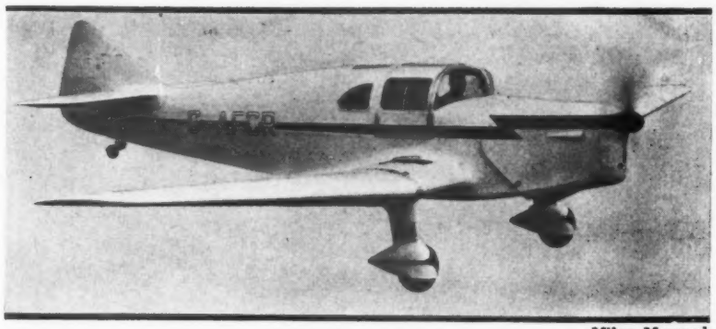

Miles Monarch

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Above: Advanced student doing wing repair.

At Right: Advanced students on fuselage repair.

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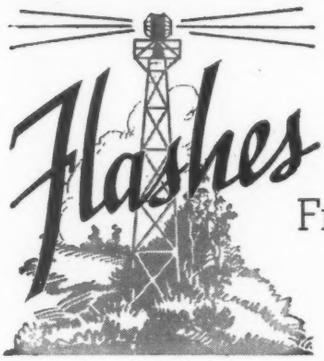
A. June, 1938



From the Skyways of the World

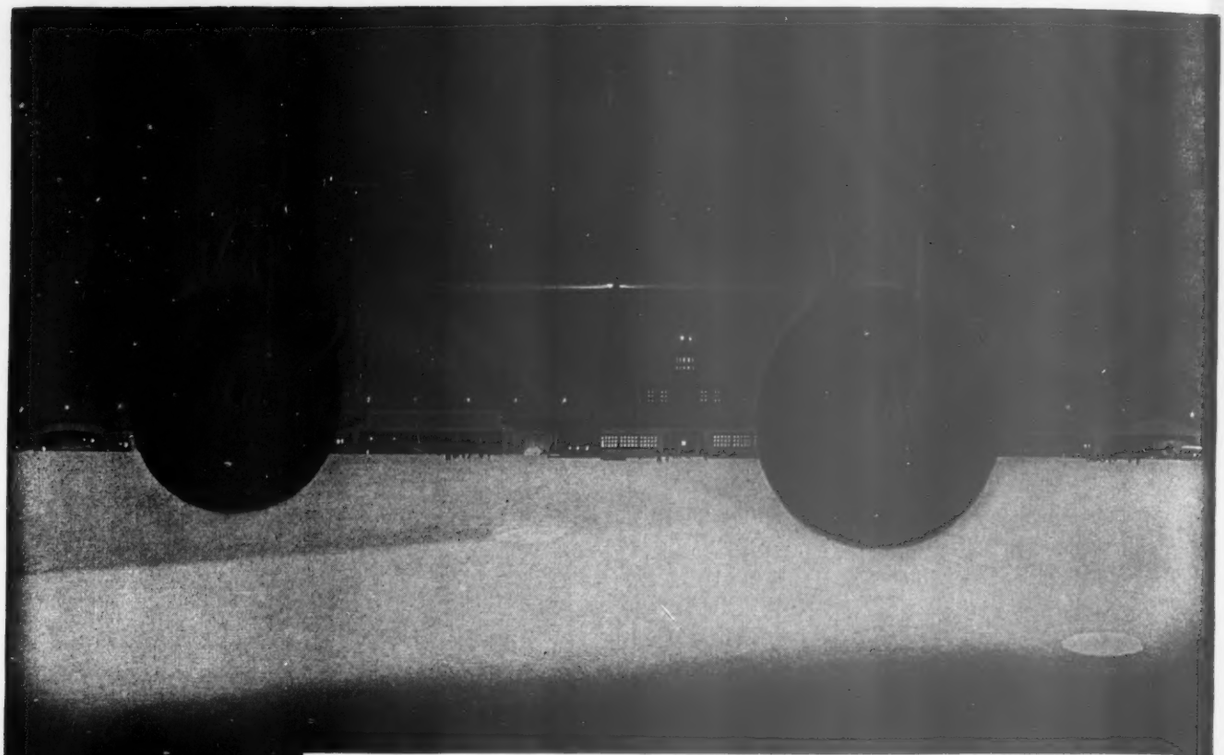
» IT'S CURIOUS how habits formed early in life persist. Just twenty years ago we spent quite a few months as a candidate for a commission in an infantry OTC, later as a cadet pilot in the Air Service. Then it was well impressed upon us that the winning of the war depended chiefly upon never passing up an opportunity to salute a Shavetail. In the last few weeks, visiting the Eastern area air bases during the maneuvers, we could meet generals, colonels and majors without a qualm, but we never caught a glimpse of a youngster with a single gold bar on his shoulder without an impelling urge to raise the right hand smartly, fingers extended, palm down, to a position at 45 degrees across the right eye, and to say "Sir".

» BUT KIDDING ASIDE, the work of the Air Corps in the war games in the New England areas was pretty impressive. We had an unusual opportunity to see something of some of the units close-up as a member of General Andrews' inspection party on May 10th. Flying in the "Command" Douglas transport, with a Northrop A-17 as escort, we visited in succession First Wing Headquarters at New Haven, the 95th Attack Squadron at Hartford, the 7th Bombardment Group at Westfield (Mass.), and the 19th Bombardment Group at Schenectady, winding up at our starting point, GHQ Air Force headquarters at Mitchel Field. Major General F. R. McCoy, in command of the 2nd Corps Area, and Ogden Reid, editor of the N. Y. Herald Tribune were also in the party.

» MOST IMPRESSIVE is General Andrews. He not only has all the personal qualifications of a general officer in the best traditions of the service, but is one of the best pilots in the Air Corps. No swivel chair general, he makes his headquarters in the air in his own ship, flying it himself as much of the time as his command duties will permit. The General Headquarters air forces, and the country at large, are fortunate indeed in having a man of the caliber of General Andrews in command of the spearhead of our national air defense.

» COMING OUT OF WASHINGTON a couple of weeks ago on a very hot afternoon we were one of twenty passengers that squirmed and sweated inside an increasingly warm airplane while take-off was delayed some ten minutes so that news photographers could record the departure of our twenty-first passenger, a shapely but (to us) unknown blond gal. Once our ordeal was over and we were in the air at a more comfortable temperature we asked the steward who the lady might be. With an air of surprise at our ignorance we were informed that it was Sally Rand—on her way to lecture to the Harvard boys, no less. But the pay-off took place after our arrival at Newark. Investigating a slight commotion atop of the field post office building from which certain weather observations are made, we found the lady who made the bubble famous peering coyly at a battery of cameras from behind one of the station's sounding balloons! Of such is airline publicity made.

"Maguire 'Umpired' that the GHQ lost the War Games!"



Wheels Down!

The beginning and the end of every flight involve Landing-Gear Security. Hence, the manufacture of airplane wheels, brakes and Pneudraulic shock struts deserves every precautionary measure known to modern engineering practice.

The wide experience and the *vast* facilities which Bendix places at your disposal are not duplicated. From thorough-going metallurgical control to the most exhaustive testing and proving of structural soundness, Bendix conducts the design, the manufacture, the testing and the field servicing of landing-gear equipment precisely as you would, if the responsibility were yours.

Wheels down! Let Bendix study your landing-gear problems and advise you. Keep your own mind clear and untroubled for the hundreds of other tough problems which beset the aircraft designer!

BENDIX PRODUCTS CORPORATION
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(Subsidiary of Bendix Aviation Corporation) South Bend, Indiana

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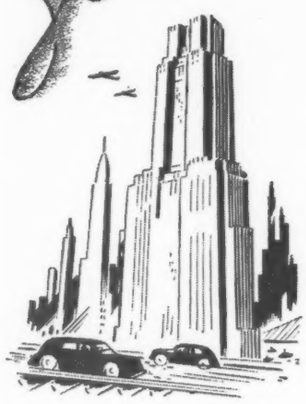


By ROBERT OSBORN

» We see by the papers that the postmaster of Big Springs, Texas, neatly boxed a big toad-stool and sent it on an air-mail tour of the country as a publicity stunt advertising National Air Mail Week.

Inadvertently this gesture was singularly appropriate for the air mail organization. The toad-stool flourishes and grows in spite of a lack of attention and care from anybody, and manages to spring back up again after being tromped on repeatedly. However, a toad-stool isn't of much value

until somebody takes the poison out of its system and shifts it over into the mushroom group.

» Our hearty congratulations to America's Number One Economic Royalist, Mr. Henry Ford, for his transplanting and reconstruction of the Wright Brothers' bicycle shop, in which was built the first successful airplane.

Whether or not one agrees with the economic policies of the New Deal, it must be admitted that Mr. Ford has improved on the Royalists of old in that he not only says, "Let them eat cake" but, by the judicious use of his accumulated wealth, provides us with some cake to eat.

» While listening to the speeches at the dedication of the Wright bicycle shop we realized that the Wright Brothers themselves established the now time-honored aviation tradition of remote and inconvenient airports. In building their airplane at Dayton, Ohio, and flying it at Kitty Hawk, N. C., they set the fashion that airplane factories must be miles away from the field and separated by barriers of narrow bridges and other natural inconveniences. Of course some modern factories are built right on the edge of airports, so that planes can be rolled out of the back door ready to fly, but this departure from our old traditions is certainly not approved in our best circles.

» Some recent Air Corps photographs show results of experiments in feeding marooned troops from the air,—the cooks dropping their rations to them by parachute from a bomber or transport flying overhead.

The method appears to be effective and satisfactory but once again progress means the loss of colorful tradition. The cooks are going to need a new mess call to replace the famous "Come and get it before I t'row it away."

» Friendly warning to Mr. Ford: Don't attempt to add "the first electric stove ever carried in an airplane" to your Greenfield Village museum. We lost count some time ago when the total claimed in the daily press reached 1,252 electric stoves.

» A Broadway columnist reports that playwright George S. Kaufman is organizing a We-Never-Fly Club, having as its motto, "Newton Was Right."

The air lines should immediately organize a We'd-Rather-Fly Club with the motto, "Time Flies And You Can't Take It With You."

» The most recent aeronautical mystery thriller is the statement by a British weekly magazine that a new type of bomber was stolen, while on its test flight, by spies of an unknown foreign power, instead of being lost in the North Sea as was reported.

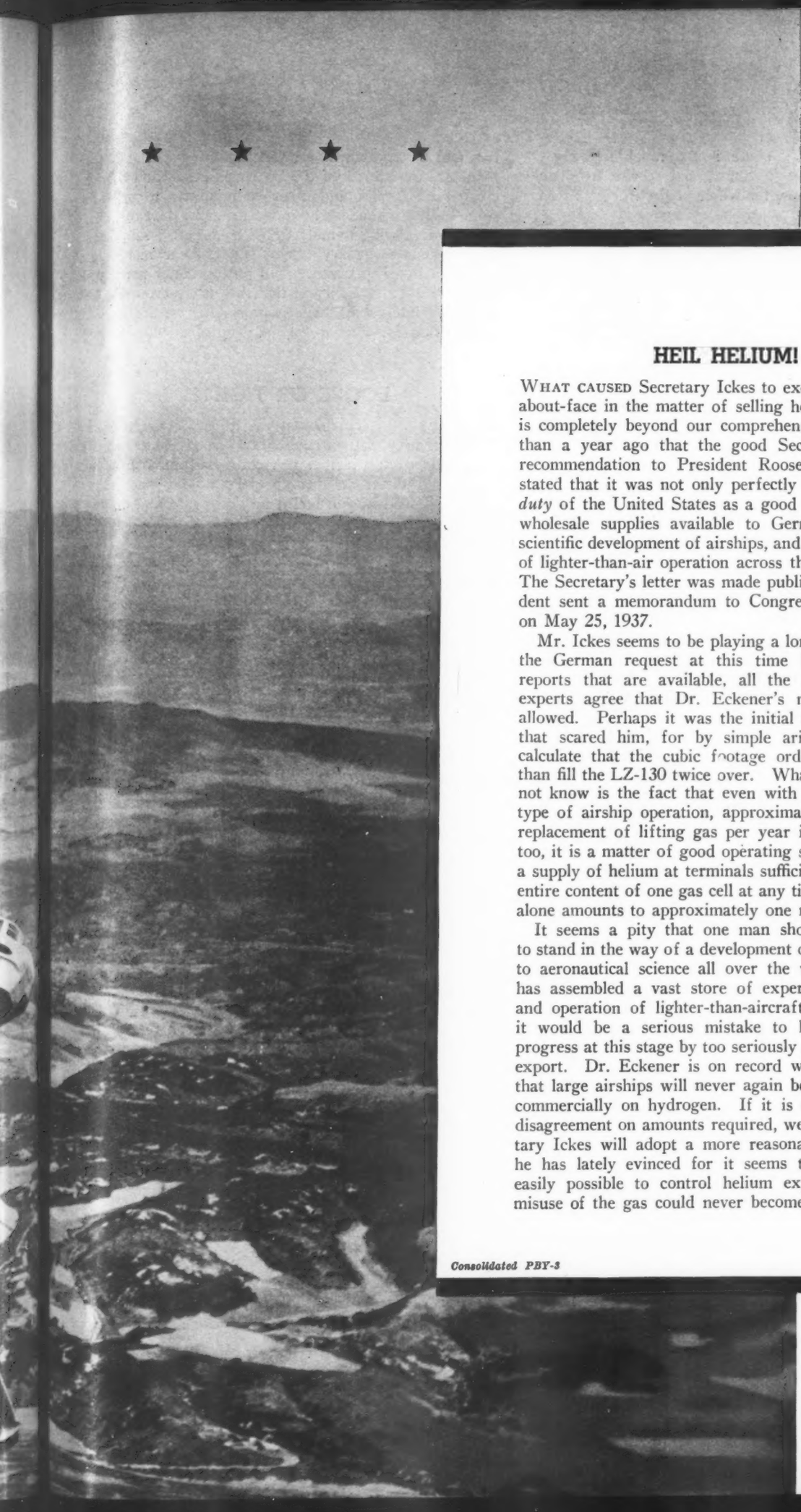
Offhand we'd say this wasn't possible. There are always so many "bugs" in a new airplane design, we

are sure that the Japanese beetle inspectors of the other country would send it right back again when it landed.

» The new method of weather forecasting developed at California Institute of Technology certainly has proved to be of great assistance to safe air line operation. This is the system which gives accurate predictions for as much as a week ahead by means of the study of "cold front" and "warm front" data obtained from stratosphere sounding balloons and weather observation flights.

For their next research project which would prove the greatest boon to every industry, especially Aviation, if successful, we suggest that Calteck undertake predicting accurately just what the government will do one week ahead. This might be accomplished by something along the same line,—a study of the cold fronts which meet some of the President's "must" legislation, and the hot air fronts from the sounding off by Congressmen.

U.S. NAVY



HEIL HELIUM!

WHAT CAUSED Secretary Ickes to execute his complete about-face in the matter of selling helium to Germany is completely beyond our comprehension. It was less than a year ago that the good Secretary signed his recommendation to President Roosevelt in which he stated that it was not only perfectly safe, but also the *duty* of the United States as a good neighbor to make wholesale supplies available to Germany to promote scientific development of airships, and to promote safety of lighter-than-air operation across the North Atlantic. The Secretary's letter was made public when the President sent a memorandum to Congress on the subject on May 25, 1937.

Mr. Ickes seems to be playing a lone hand in spiking the German request at this time for, according to reports that are available, all the Army and Navy experts agree that Dr. Eckener's request should be allowed. Perhaps it was the initial amount requested that scared him, for by simple arithmetic he could calculate that the cubic footage ordered would more than fill the LZ-130 twice over. What he probably did not know is the fact that even with the most efficient type of airship operation, approximately 100 per cent replacement of lifting gas per year is normal. Then, too, it is a matter of good operating safety to maintain a supply of helium at terminals sufficient to replace the entire content of one gas cell at any time. That reserve alone amounts to approximately one million cubic feet.

It seems a pity that one man should thus be able to stand in the way of a development of real importance to aeronautical science all over the world. Germany has assembled a vast store of experience in building and operation of lighter-than-aircraft, and we believe it would be a serious mistake to hamstring airship progress at this stage by too seriously restricting helium export. Dr. Eckener is on record with the statement that large airships will never again be permitted to fly commercially on hydrogen. If it is only a matter of disagreement on amounts required, we hope that Secretary Ickes will adopt a more reasonable attitude than he has lately evinced for it seems that it should be easily possible to control helium export so that the misuse of the gas could never become a serious threat

Consolidated PBY-3

to our own security. There is too much to be yet learned about airships in commercial service to allow senseless fears to stymie the whole project.

SPRING SCHEDULES

YEAR AFTER YEAR there are certain more or less fixed events on the aviation calendar that we look forward to with particular interest and anticipation. This year one of them is conspicuously missing—the industry's trek to the great NACA laboratories at Langley Field where basic research that keeps America first in the air goes tirelessly forward. Recognizing the necessity for cancelling the conference under present conditions, we regret, none-the-less, that it must be postponed, for past gatherings have been a constant source of interest and inspiration to the whole industry.

We trust, however, that nothing will interfere with the annual assemblage of Soarers at Elmira. Elmira in the soaring season is one of our favorite places. After a warm day with the sailplaners on Harris Hill the relaxation afforded in the inner air-conditioned reaches of the Mark Twain, or on the terrace at Hilltop is something to grow lyrical about. The general atmosphere always reminds us of an Air Show or the Air Races—it's so different. Missing are the noise and excitement—absent the hectic milling about accompanied by the sounds of rending furniture and splintering crockery. Perhaps it's because the sailplaners haven't yet grown up to the point of sophistication long since attained by their power-flying brethren. We hope they never do.

Fun is fun, of course, in anybody's league, but there is more to the Elmira show than a pleasant passing of days and nights. There is emerging at long last at the Harris Hill site the beginning of a movement that can be of tremendous importance to aviation in America, for in soaring comes a rare combination of pure sport with a dividend-paying investment. There is as much pleasure to be had in riding the thermals as in handling a spirited sail boat on a brisk day. At the same time there are no more sedulous seekers after aerodynamic and structural efficiency than the builders of the sleek and graceful soaring machines. And the lads who spend their time studying the behavior of the passing "fronts" for the benefit of an aspiring soaring record-seeker make continual contribution to a growing fund of meteorological knowledge that guarantees safe operating conditions for coast-to-coast transports.

Time was, and not long since, when soarers in America were content to look overseas for information and for equipment for their favorite sport. Now, thanks to the efforts of the Soaring Society and of the citizens of Elmira and other communities to provide suitable sites and adequate inducement for development, there is a growing number of U. S.-designed sailplanes and efficient secondary types. Every year more and more put in an appearance, and put up better performances. Rumors are current that this year's crop will be unusually interesting. We hope so, for we are all set to shove off for Elmira—at the drop of a sun helmet.

LOOSE OR TIGHT?

EVERYONE HAS AGREED that the miscellaneous aircraft operators are badly in need of a protective organization, but the agreement stops right there. Almost everyone has a different idea about how they should be organized. When you boil it all down you find on one hand the advocates of a strong, expensive, central group to fight federal legislation in Washington, and on the other hand, a loosely associated collection of local groups with little or no overriding organization. Somewhere in between is the happy medium.

An operator's problems begin right on his own airport and it seems logical that his organization should begin there too. First job is to eliminate the destructive elements of price cutting among competitors on the same field. Then he must go out and attend to the cream skimming itinerant who sets himself up with a fully depreciated crate in the next pasture, reaps a harvest during the busy season, and retreats to Florida when it gets too cold for business up north. Next job is to go to work on his state legislature for protective and promotional aids. Finally there are the Bureau of Air Commerce and Congress to deal with.

Experience has shown that the local organization can do the first three of these jobs efficiently and economically. And given a good collection of active local groups, there should be no trouble in superimposing a national body of modest proportions to act as Washington spokesman for the operators. A similar setup, the American Trucking Associations, Inc., has done much to solve the problems of the truck operators and there is a striking resemblance between the two types of business. It would be well for the aircraft operators, who are forming local organizations in many parts of the country, to take a tip from the truckers and build up their association on a similar plan. And those airports which are not organized, should take immediate steps to set themselves up so that their voices will be heard along with the others.

TRANS-CANADA Rubs the Lamp

Did you ever dream you were building a brand new air line? You know as much about it, right at the start, as it has taken us twenty years to learn. You have plenty of money to spend. You have no worries over government contracts, or competing air lines. You don't even have to hurry. Here's how the men at the controls of Canada's new trans-continental airway are behaving in just such a situation.

By Daniel Sayre
Associate Editor, AVIATION

THERE'S BIG-LEAGUE AIR TRANSPORT HISTORY in the making across the Canadian border these days. Most of it is as hard to believe as a phone call on April Fools' Day telling you you've just won the Sweepstakes. At least it is just about that incredible if you have been brought up on the trial-and-error, rush-it-through tradition of our own air lines.

To strip-map it in a few words—The Canadians, after all these years, are finally building themselves a trans-continental air line. Since last Sept. 1, the company which will operate the coast-to-coast route has been operating a complete service between Seattle and Vancouver. Since early March it has been running an experimental air mail service between Vancouver and Winnipeg. By early summer there should be enough planes on hand and enough training under the belt to permit full service on that section. Experimental flying is to be pushed steadily eastward. Eventually operations will be carried clear through to Moncton, and probably Halifax and St. John.

But it isn't that the Canucks are doing this thing that's really important, but how they went about it, and why they went about it in that way, and how we are to score up what they will or will not accomplish. And that requires a little backgrounding.

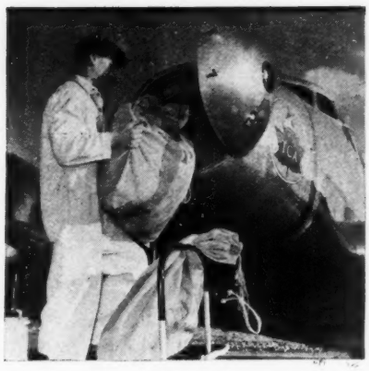
It's a lot easier to explain why Canada should be building a trans-continental air line, than to explain why it hasn't built one long since. Geographically it has all those elements that have made the United States such an ideal laboratory for air transport development—vast distances; freedom from internal political barriers; a wide distribution east and west of the centers of finance, industry, government, agriculture and mining; a railroad system connecting those centers sufficiently to have built up flows of traffic ready for the tapping by a swifter means of transport. Some will argue that Canada has but 12,000,000 people in an area larger than the United States and is thus less favorable to air line exploitation. But the large majority of those 12,000,000 live within a long east-west band along the American border, a band no wider at any point than 200

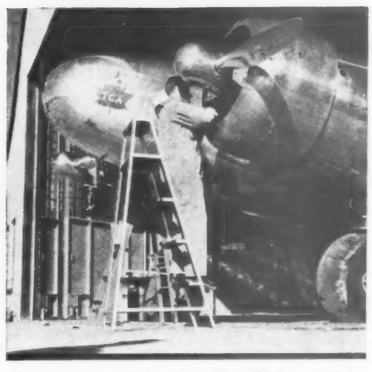
D. R. MacLaren

P. G. Johnson

S. J. Hungerford

C. D. Howe





Trans-Canada will be the Dominion's first real modern airline, but it will have the advantage of every lesson in equipment and technique the air world has learned in twenty years. Personnel is already going hammer and tongs at an elaborate training program.

miles and generally much narrower. And by our book such a strip is no less than ideal for an airline.

Certainly Canada's lack has not been one of airmen. J. A. D. MacCurdy made the Dominion's first flight in 1909, months before anyone had flown a plane in England. Major Bishop and his fellow Canadian wartime pilots were the equals or betters of any comparable group in the British forces. In the early post-war years Canadian flyers pushed forward the arts of forest patrol, aerial surveying and the use of airplanes in rugged wilderness until they were undisputed world leaders in those fields. Later the development of government-assisted flying clubs along the British pattern kept Canada's pilots-per-capita ratio almost as high as our own.

By the end of the 'twenties when our own first air mail contractors were still cutting their eye teeth, the whole map of Canada—including several sections of the transcontinental route—began blossoming forth with air mail routes. Few were as well backed financially as our own. All of them had to struggle against worse winter seasons than were general in the States—and in that stage of the art low temperatures and snow were still distinctly formidable. But the effort was very creditable indeed.

So far—save for a slight British accent—it would have been difficult to find any marked divergence between American and Canadian flying. But in 1930 the Canadian electorate rose up in all its power and turned out a party called the Liberals and turned in one called the Conservatives. It seems that in general Canadian political labels don't mean much—but the Conservatives proved certainly far less liberal to air transport than their opposition had. In any case the air mail budget was cut down to just enough to keep a few into-the-wilds air mail contracts going. The beginnings of the coast-to-coast service fell into nothing.

All, that is, save a chain of some 92 airports that had been started along the route in 1927 by the Ministry of National Defense. Even under the Conservatives these continued as one of the Dominion's prize relief projects. Other things came to the rescue, too, the world wide mining boom poured new life into the charter and semi-scheduled services from the "end of steel" into the remote stretches of the northlands. The air lines in the States developed sufficiently to permit the merchant of Montreal to do air mail business with his Vancouver customer via New York-Chicago-Seattle. And other Canadian cities worked out similar cross-border air mail habits.

The Trans-Canada Act

By 1935 the electorate in its wisdom was once more ready to in the outs and vice versa—back came the Liberals and with them a new deal for air transport.

Move (1) Control of civil aviation was taken from the Ministry of National Defense and given to a Ministry of Transport (newly created from the old Department of Railways and Canals). With control, incidentally, came direct charge of work on the airport chain. Move (2) C. D. Howe was made Minister of Transport. Under him Commander C. P. Edwards was made Chief of Air Services. J. A. Wilson, who had done yeoman service as Controller of Civil Aviation under the old set-up, continued under Edwards in a post with the same title.

Move (3) The Dominion Parliament passed the so-called "Trans-Canada Air Lines Act". And it received Royal Assent on April 10, 1937. Now this is a very remarkable Act indeed and must be understood thoroughly.

It provides: (a) For the creation of a corporation to be known as the Trans-Canada Air Lines with an authorized capital of $5,000,000 (b) That all shares should be offered at par to the Canadian National Railway Company, which may sell up to 49.8 per cent of them, but only to British subjects. (c) That four of seven directors be elected by the share-holders; three appointed by the Governor in Council. (d) That the Minister of Transport enter into contract with Trans-Canada Air lines for the operation of certain airlines for not less than ten years. Charges for mail, passengers and express are to be fixed by the Ministry but are to be "competitive with other similar transport services in North America". (e) That the government will furnish and maintain emergency fields, radio beams and lights and provide weather forecasts. (f) That during a "preliminary period"—until Dec. 31, 1939—the Parliament will pay a subsidy equal to any operating deficit the company may suffer. (g) That thereafter mail rates shall be fixed so that any deficit incurred one year will be eliminated during the following year. Or if a profit is made the mail rates shall be cut

by the amount of half of such profit. However mail rates are never to be lower than rates paid for coast to coast mail service in the United States. And "expenses" are defined for purposes of figuring profits and losses as inclusive of provisions for depreciation, insurance *and 5 per cent interest on the capital invested.*

All of which sounds like a marvelous set-up for the owners of Canadian National Railways. But remember that the owners of the Canadian National Railways are the Canadian people through the Canadian Government. Trans-Canada becomes therefore not only an experiment in the control of an air line by a railroad but also an experiment in direct government ownership—no matter how indirectly the psychological bookkeeping may be kept.

Yankee Advisers

The last thing you can imagine a government-railroad-owned air line in the U. S. doing is hiring a foreigner to head up its early and critical destinies. Yet the ink was hardly dry on the Act before Trans-Canada stepped across the border and engaged P. G. Johnson, as Vice-President in charge of Operations responsible solely to S. J. Hungerford (who as Chairman and President of Canadian National Railways became President of the new air line). Thus in one direct move Trans-Canada gained first hand experience with two decades of American aeronautical development. Johnson had been in that industry since 1917. He had served as Vice-President and President of the Boeing Airplane Company, as President of United Airways, as President of United Aircraft and Transport. If it hadn't been for the Great Cancellation Nonsense of 1934 he would have still been one of this country's leading aeronautical executives.

Trans-Canada next might have loaded the new line up with local 100-per-centers, or even made a gesture to the Mother Country by balancing the American influence with an adviser or two from Imperial Airways. It did neither. It made Major D. R. MacLaren—a former Wing Commander in the R.C.A.F. and an Assistant General Manager of the Pacific Lines of Canadian Airways—assistant to Mr. Johnson. Then it backed Johnson up in securing as brilliant an array of talent as could be lured from air line berths in the States. From United came D. B. Collyer as Chief Technical Adviser; H. O. West to be Technical Adviser in the fields of maintenance and overhaul; H. T. Lewis as Technical Adviser, Flying; and O. T. Larsen as Technical Adviser, Meteorology and Dispatch. S. S. Stevens joined up as Technical Adviser on Communications from Eastern Air Lines.

Now don't get the idea that all this was simply a blind or political sellout of some kind. By the time the Canadian authorities got the go-ahead on a trans-continental route, they had reached a certainty that it was air transport on the American model that was best suited for Canadian purposes. Even had England any first class equipment to spare, it would not have been so perfectly proved under North American conditions. America obviously led in night flying—necessary for real competition with Canada's good east-west surface transport and nearby parallel air lines in the States. Canada's own airmen were thoroughly experienced—in contact flying. But again it was only in America that Canada could get the instruments, the radio and the flying technique with which to set up a service that could even indirectly complete with our air lines.

And of course the American contingent was hired with the plain understanding that theirs was to be a temporary role; that they were to impart then depart, so to speak. But it took definite courage and considerable over riding of impatient local patriot-

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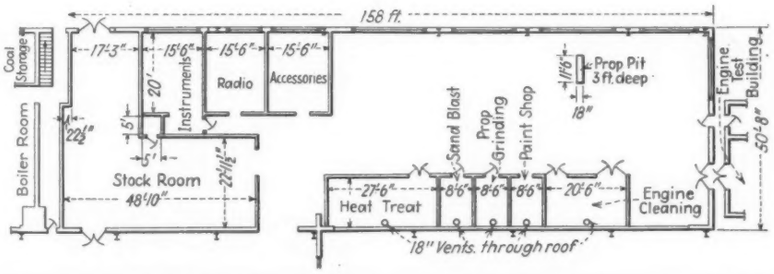
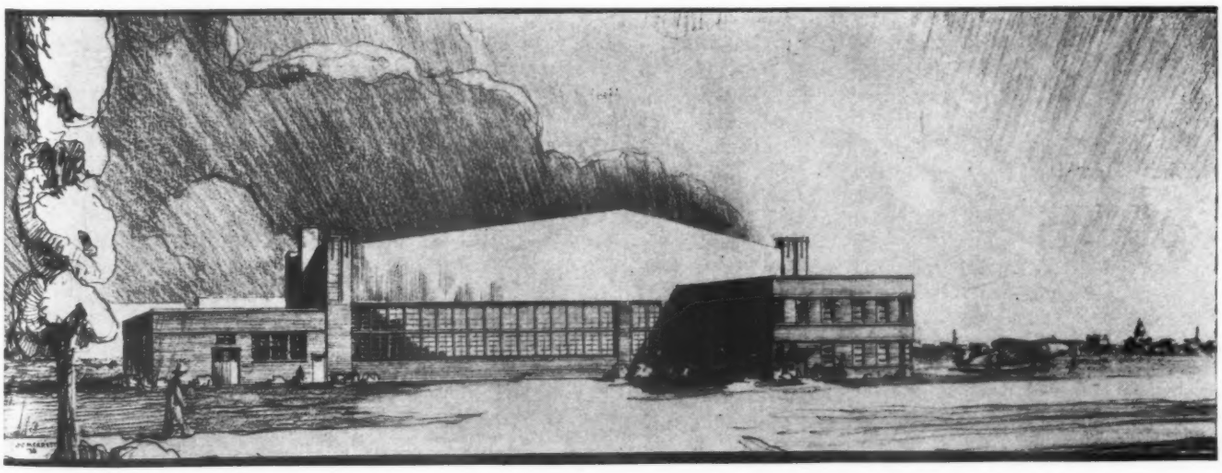


Trans-Canada's main overhaul base will be at Winnipeg where this "ideal" Austin hangar is nearing completion. Trusses are so designed that the present clear span of 100 ft. can be extended to 200. A two-storied wing is provided for operations and executive offices. The shop layout is by Oliver West.



LEGAL HORIZONS

Aviation in America is in danger of overregulation. It is important now to survey the legal situation and chart a course for the logical development of the air laws of the future.

By John S. Wynne

THE RAILROAD'S IRON HORSE of the nineteenth century wrought many changes in the law of this land as well as the world. And we find today that aviation's flying steed, the twentieth century wonder of transportation, is doing the same.

Air law divides broadly into two parts: national and international. First let us glance at some of the interesting national problems that are puzzling legislators and keeping aviation's attorneys awake at night.

There are some who think that the solution to every problem is the enactment of another law. That is why we have too many laws already. Others hold law and regulations in contempt and prefer the creed "my conscience is my guide." That is why it is so hard to get all interested parties to agree on a sound basic law.

While we have many laws, we find also many serious gaps between them. Another complexity is the number of Federal agencies that already have a hand on the controls. Hardly a Department in Washington not involved in commercial and private flying.

BUT THE OUTSTANDING PROBLEM of conflict, yet unsolved, lies between the sovereign jurisdiction of the Federal Government over interstate air commerce and the sovereign jurisdiction of the individual states over intrastate flying. Just where one begins and the other ends is not always easy to see. Whether or not the state sovereignty over its own air will prevail is a question. Suffice it to say that up to now the Federal Government and the States have adjusted their differences in a cooperative and friendly manner. The day is not far distant, however, when some issue of great importance will arise and some State will challenge the authority of the Federal Government. The battle will be on.

Who owns the air and how do you occupy it? Ancient law said, concerning the ownership of land, "That which belongs to no one is by natural reason granted to the occupant." This was the old doctrine that might was right and effectively carried out by one's own physical ability to occupy effectively and control his acquisitions. We have a version of it today in "possession is nine points of the law."

Lord Coke, to clarify the rights of property owners to the sole use of air superadjacent to the land, laid down the well known maxim, namely, "Cujust est solum ejus et usques ad coelum" (to the middle of the earth and up to the sky). The English jurists cling tenaciously to the literal interpretation of both the 'ad coelum' theory and the Doctrine of Ancient Lights. The Doctrine of Ancient Lights was the right of an individual to free light and air: that one could not obstruct the light to another's windows by building too close. The American courts, with few exceptions, refused to recognize the Doctrine of Ancient Lights, and have since repeatedly held that one cannot hold an easement to air not possessed. They have been more logical than the English in that they hold the recognition of the common ownership of all that which is not possessed, and refuse to recognize allegations of possession unless there is an "effective possession."

The travel of aircraft through air space is not in itself unlawful. It does not constitute a trespass. A constitutional amendment is not necessary to legalize use of the air. It would seem here to follow that air travel over other people's property would lead to the doctrine of "Damnum absqua Injuria" (damages without legal injury). A modern illustration of the application of the Doctrine, "Damages without legal injury", would be a case of this kind: John Brown owns a home which he has enjoyed for years because there were no buildings next to him. Suddenly, on the lot next to him a dentist builds a home and office. The dentist's machinery causes considerable noise and vibration much to the annoyance of John Brown. The courts have held that John Brown is without recourse in a situation of this kind, in that the dentist has a full right to the enjoyment of his home and the reasonable use thereof. Similarly the accustomed 500 feet altitude may cause some harm, potential danger or inconvenience to the occupier of the land below, yet has harm actually been done?

IN THE CASE of Hinman vs. Western Air, a Circuit Court of Appeals held that the plaintiff *was not entitled* to injunctive relief against low flying airplanes over his land unless a showing be made of actual damage or harm suffered. Airports are not generally allowed in strictly residential or property sections where the attributes of

"peace and quiet" are expected, but where an airport is situated in the industrial and commercial area of a community with its accustomed noise, smoke, etc., "peace and quiet" have already been destroyed and aerial navigation should not be penalized for destroying that which already is non-existent.

An interesting version of the increasing conflict between the rights of property owners and the right of aircraft to use the air space above the property owner was brought out in this case. A California owner of property adjacent to an airport objected to low flying by airline operators. He established a dummy airport on his property, bought an airplane, and stated his intention to use the superadjacent air himself. This was an attempt on the part of the owner of the land to occupy or possess the air above his land. At the same time it was an attempt on the part of the owner to prevent an easement of the use of the air space above his land by the air transport operators. This problem is still in flux.

THE SMART BOYS are working on these problems but they have not yet found the answer. Let us hope in finding it they bear in mind the doctrine of Ancient Lights and the doctrine of "Damnum absqua injuria", and last but not least, our old friend the sovereign rights of the individual states.

Let us take another look. In 1935 an attempt was made in California to introduce in evidence regulations relating to the licensing of aircraft and rules of air traffic. The Supreme Court of California said that the State was vested with "exclusive power" to prescribe air traffic rules to govern the operation of aircraft flying in purely *intrastate flights.* The Court said that when an accident occurred in intrastate traffic, it is not charged with jurisdiction, knowledge of air laws and regulations for interstate air traffic. This was the case in which Kenneth Hawkes, first husband of Mary Astor, the movie star, was killed in a collision between two airplanes after taking off from an airport in California, the accident occurring in mid air still over California.

There are some seventy odd bills in the Senate and the House treating with the regulatory safety or economic features of aviation. Some are good, most are bad, but the old adage of "too many cooks spoil the broth" is certainly appropriate at this time, in that most of the sponsors of these bills are not well informed but lean to a particular creed born from personal whims and lack of unbiased information. It is hoped that the industry will lend its best brains to the subject and work out cooperatively some good answers. It will take a lot of hard work.

IT IS EASIER to have a law passed than to repeal it. It would, therefore, appear sound for those interested in aviation law to plan for appropriate legislation rather than letting numerous laws, covering any and all subjects, appear on the statutes. This will be especially true in state legislation. It is to be hoped they will pattern after the lead of the policy of the Federal Government as this will help for uniformity.

We have numerous important groups in aviation engaged in their particular phase in education and formulating laws to protect their interest, such as: The Aeronautical Chamber of Commerce, the National Aeronautic Association, the Institute of the Aeronautical Sciences, the National Advisory Committee for Aeronautics, The State Aviation Officials Association, The Air Transport Association, and last but not least the Airline Pilots Association. All of these organizations serve useful purposes at one time and another, but it is apparent to anyone who will observe closely that an overlapping of interest is occurring and what is more regrettable, a hostility between groups because of a lack of interest in the other fellow's problem. The main thing is to see that intelligent legislation is put on the books and that bad legislation is kept off the books, both by the States and by the Federal Government. It is urged that all groups listed above should get together annually and see if some common ground cannot be agreed upon in their respective fields, and work as an industry rather than as barnstormers of old.

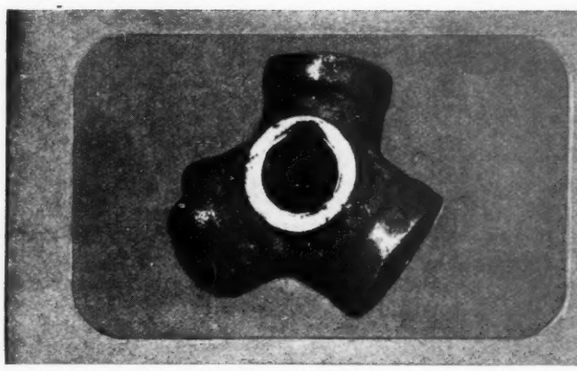
Permit me a few remarks about the economic phase of our legal-aeronautical future. The most important of these to my mind is the bankers' lack of confidence in the industry. His experience with aviation has been discouraging. Stability to the air transport industry today can only come through franchises, or certificates of convenience and necessity. This will restore the bankers' faith in the industry. You might say, of what interest is this to the rest of the industry in that private flying will be greater some day than the entire air transport system. Granted, but I argue that we are still in the educational stage of teaching the public to fly. It is reasonable to suppose that people will fly as passengers before they will desire to be taught to fly and control a plane of their own. Therefore, every passenger carried by an air transport company is normally creating a percentage of individuals who are interested in perhaps owning their own planes. In fact, it can be said without contravention that there is less sales resistance today in taking a man on his first flight on a regular scheduled flight than there is in putting him in the plane of a friend or selling demonstrator where there is less confidence in the pilot, and usually, a smaller plane. In the case of Army, Navy, and National Guard planes, no one is supposed to fly with the pilot, under existing regulations, other than regular and organized reserve personnel. My argument is that anything which helps the expansion and use of scheduled air transportation is of direct benefit to the advancement of the industry as a whole.

WHAT IS this "certificate of convenience and necessity" that we hear so much about? Perhaps a little history would be interesting. The existence of "certificates of convenience and necessity" was born as a matter of necessity for mutual protection and regulation of railroad transportation. Later busses were included. We are about to witness the entrance of air transportation into this field of franchise and control. The wisdom of restricting new lines of railroads or extensions was recognized by the legislatures of many states long before the enactment of the Transportation Act. New York, Illinois, Wisconsin, Pennsylvania, Kansas and several other states had passed statutes requiring a showing of "Public Convenience and Necessity" as a prerequisite to the building of railroad lines. As early as 1894 we find a case arising under the general railroad law of the State of New York. In this case the Court said: "Formerly, it was within the power of any body of persons, sufficiently numerous, and possessing the requisite capital, to construct a railroad at any time, between any termini they might select, the route

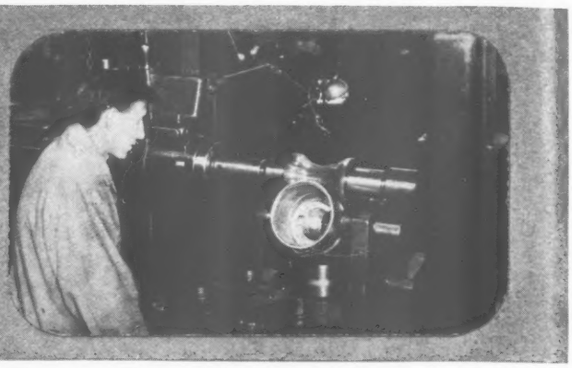
(Turn to page 46)

BIRTH OF A **PROPELLER**

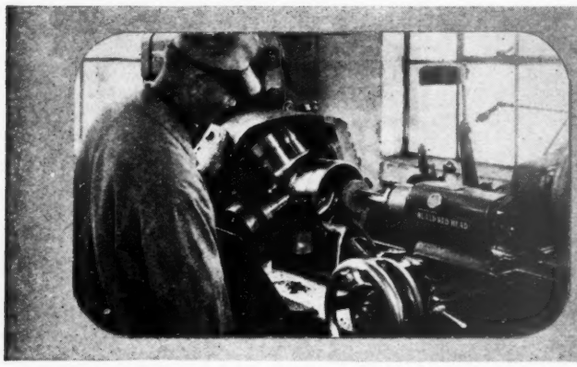
Picture trip through Curtiss-Wright Company's propeller manufacturing unit at Buffalo. Following through an electrical controllable pitch propeller from rough forging to finished product.



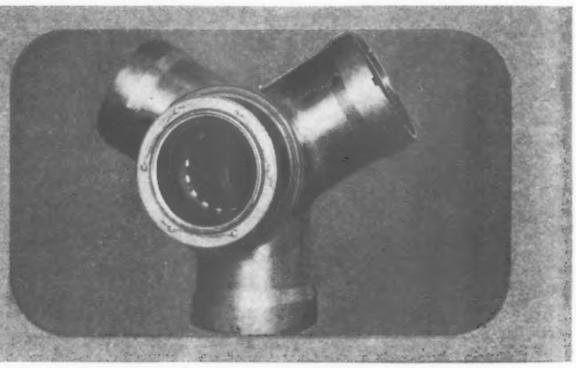
1 Rough hub is chrome-nickel-moly-steel drop forged to exacting specifications.



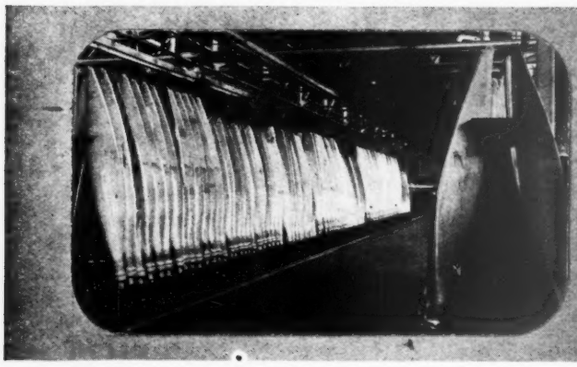
2 Forgings are rough machined, examined by magnaflux method for cracks.



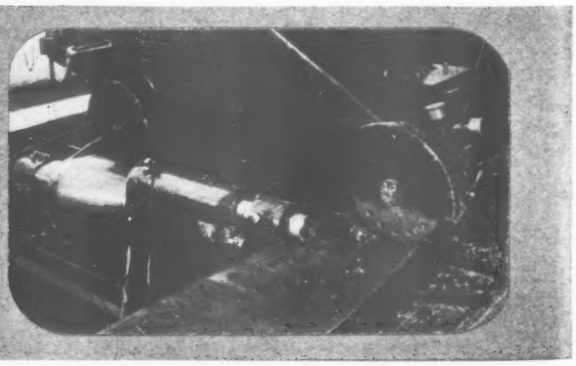
3 Final machining includes internal grinding in hub sockets to very precise tolerances.



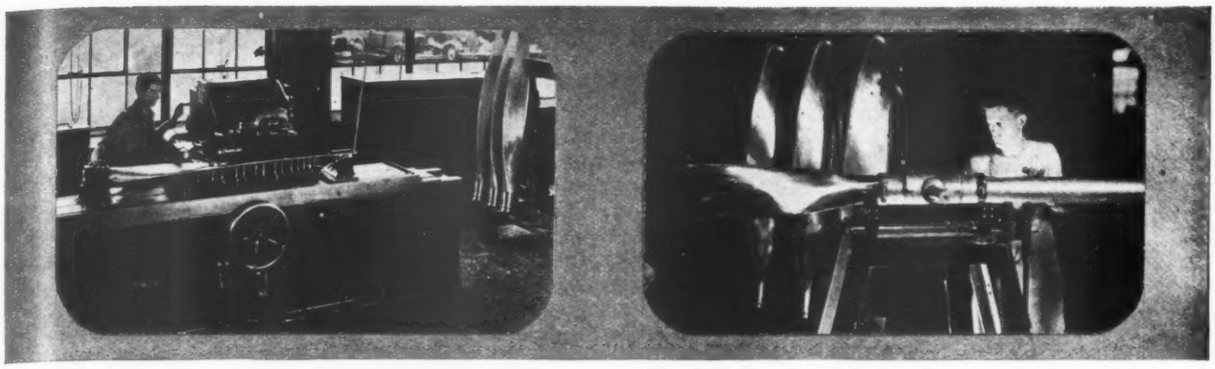
4 In final form the hub is beautifully machined all over, bears little resemblance to the rough forging.



5 Part of the stock of forged aluminum alloy blades before surfacing and final machining of hub ends.

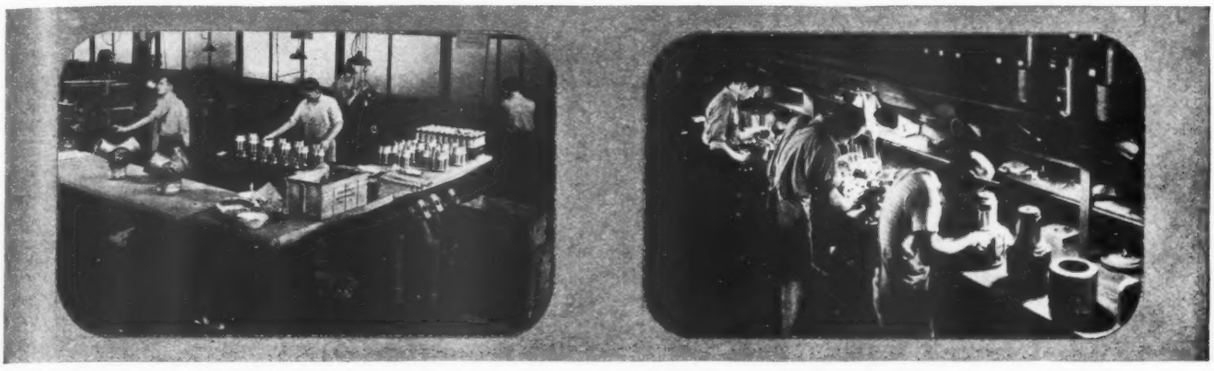


6 Closeup of blade profiling operation in one of the Engineering & Research Corp. profiling machines.



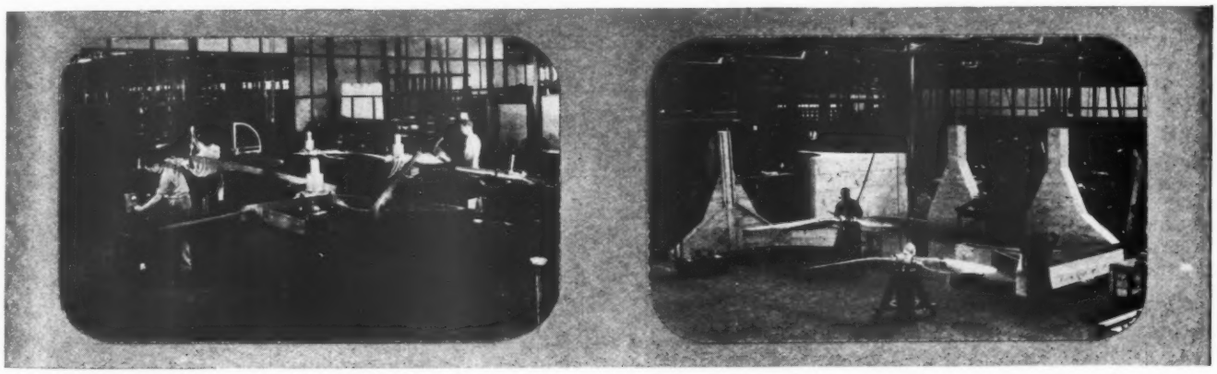
7 General view of the E & R Corp. profiling machine with blade set up in place on table.

8 After finishing, each blade is carefully balanced against a master blade.



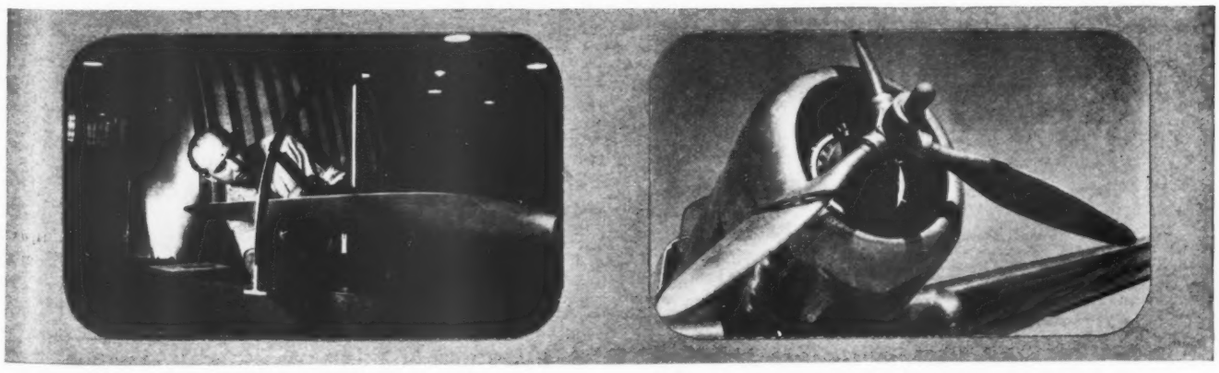
9 Operating motors and auxiliary electrical equipment are checked in before final assembly.

10 Pitch changing mechanisms with motors and gear trains are put together with watch-like accuracy.



11 General view of final assembly department with inspectors checking for correct operation.

12 Further along in final assembly with wooden shipping cases taking shape in the background.



13 A final check on the protractor table for correct pitch in various positions.

14 The final product, a Curtiss-Wright electric controllable, mounted on an Army pursuit ship.

What's Wrong with CAR ?

AVIATION'S Washington Bureau

EXCERPTS FROM A LETTER TO MEMBERS OF THE SOUTHWEST PLANNING CONFERENCE

"TO paraphrase a very apt remark once made by Ely Culbertson, 'It is perfectly proper to criticize the rules, but first *know* the rules.' We in the Bureau of Air Commerce have found that about nine out of every ten of the criticisms directed at the Air Traffic Rules were based on misunderstanding or lack of understanding, and an amazing number of the criticisms started out somewhat in the following manner: 'I have heard that—.'

"We sincerely believe that the revised Air Traffic Rules, embodying as they do the changes suggested in every constructive comment and criticism, if compatible with safety, will summarize concisely into the following statements: first, that insofar as the Air Traffic Rules are concerned, the itinerant pilot may fly with exactly the same latitude as before over any part of the United States, at any altitude and at any time, provided he and his airplane are properly qualified to do so, and that the restrictions placed upon the contact flyer are merely those based on the imperative need for safety precautions on certain busy airways and air terminals upon which instrument traffic will be converging during times of little or no visibility; second, that a pilot, whoever he may be, who is equipped and qualified to fly by instruments will be afforded every protection possible, insofar as the present facilities of the civil airways make this protection possible, and further that additional known safety features are being installed on the civil airways as rapidly as funds and delivery of equipment makes it possible.

"There will be, without doubt, further misunderstandings of the provisions of the Air Traffic Rules, as is the case with any new law or regulation, and these misunderstandings it is, of course, our desire and duty to clarify as fast as we hear about them — naturally, we cannot until we do hear about them.

"No amount of 'hanger gossip' or indignant discussion can serve any useful purpose unless one of the individuals in the discussion takes the time to reduce the thoughts to writing, pointing out the specific injustice which he and his associates feel has been done. If he will then forward his letter to the Bureau of Air Commerce at Washington, he will find that the Bureau actually welcomes the opportunity either to rectify a mistake or explain an apparent injustice."

Quoted from a letter written by Earl Ward, Chief of the Airways Operations Division, Bureau of Air Commerce

SINCE THE CIVIL AIR REGULATIONS went into effect, a number of private flyers have complained that the rules hamper their freedom. But when these pilots ask questions of Bureau of Air Commerce men traveling about the country, or write in to headquarters at Washington, they find that the answers are nothing to keep anybody on the ground. Looking in on the Bureau department heads, and kibitzing into their correspondence a bit, we find they are asked some 200 questions by private flyers—and those who want to be. But a quick boiling down of the questions shows they are mostly a half dozen queries made in different ways. And simmering the answers down likewise makes a short and easy story.

Traffic rules for private flying are really very simple. There are two reasons why they may seem complicated. One, the Department of Commerce had to write them so that pilots, scientists, laymen, and lawyers could all understand them. It's difficult to please so many kinds of people with the same style of writing. Second, the rules are actually law, and law has to be written clearly and definitely, so it cannot be misunderstood.

On the other hand, some of "Chapter 160" may seem *too* simple. at least too obvious. Professional aviators find in it rules requiring them to do things that they have always done as a matter of course. But they must remember that there are thousands of youngsters who do not yet have the basic foundation and practice on which to go, and must get knowledge from

the written or spoken word. And again, while these ABC rules are obvious, they cannot be omitted from the "law." It's obvious you can't drive your car at night without lights, but the law *says* you can't do it, just the same. There is nothing in the air traffic rules except procedure demonstrated by actual and continued usage to be good flying practice.

The "general flight rules" are those rules of the road which have been observed ever since there were any flying regulations whatsoever and, so to speak, grew with the science as the need developed. The grouping may be different, the phraseology somewhat changed, but actually the same old rules apply, such as: Safe altitudes of flight; don't throw things overboard; stay away from penal institutions and military reservations; take off into the wind; land the same way; use all the field possible. Those and similar elementary rules make up the common sense of flying. The general flight rules are those which should be studied by a flying student coincidentally with his ground school work and primary flight training. They should have become automatic reactions by the time the young pilot has sufficiently progressed to be able to make cross country flights in good weather.

After progressing beyond the elements of general flight rules it becomes necessary to draw a definite line of distinction between those flights made in weather conditions such as to permit navigation solely by observing objects on the ground, and those flights requiring navigation, either wholly or in part, by the aid of instruments and radio.

For the first, the contact flyer, it is expected that he will have sufficient visibility to do a satisfactory job of navigation. If this is true there should be sufficient visibility to see other aircraft and to be seen by the pilots of other aircraft in the immediate vicinity in time to avoid collision. In the flight rules, contact flying is predicated on that theory. Careful reading of the rules will clearly indicate that *the only requirements for a pilot to make a contact flight (of course in addition to general flight rules) is that he know the weather conditions under which contact flight may be made, and, that he observe these rules.*

The contact pilot need not concern himself with flight plans or flight plan changes, precise altitudes of flight, dispatches for his movements, the direction, color designation, or control of civil airways. Again assuming that the general flight rules are observed he may fly between any two points in the United States without ever knowing that he is in or out of the civil airways, in or out of control zones of intersection. It is not necessary that he have any knowledge of the many rules for the protection of instrument flyers, provided he has adequate visibility to see and be seen and stays a sufficient distance away from the clouds. (A cloud might cover another airplane just about to pop out of it at 200 m.p.h.)

The above may be summarized precisely and accurately in the following sentence. *The contact pilot need only know the general flight rules and the weather conditions under which contact flight may be made, and then observe them.*

To refer again to the three categories, general, contact, and instrument flight rules, it should be noted that the general flight rules apply to flights anywhere in the United States, but that contact and instrument flight rules apply to only those portions of the United States over which it is possible to fly by instruments alone, using the ground facilities provided by the Bureau of Air Commerce, namely the civil airways of the United States. The federal government does not adequately equip an airway, or aerial highway, until such time as the traffic warrants. Therefore it has made no regulations which put any restriction whatsoever on pilots flying outside the civil airways unless they are engaged in interstate or foreign air commerce.

Instrument flying rules necessarily are much more rigid and exacting, inasmuch as the vital means for the prevention of collision between two aircraft in flight, on instruments, is by instructions and information relayed to and from the pilots of these aircraft through the medium of ground control. Those pilots who propose, after being properly rated, to fly instruments, can secure no better or cheaper life insurance than by devoting as much time as is necessary to a thorough study of Part 160.5 of the Air Traffic Rules which is devoted entirely to procedure when flying on instruments.

Only relatively few pilots have progressed to the degree of proficiency necessary to navigate cross country by the aid of instruments and radio alone. All together they make up probably not more than two or three per cent of the total of all pilots. Devoting the necessary magazine space to analysis of the instrument rules for a handful of men would not be justified. The rules as codified by the Bureau seem to be clear, concise and understandable.

At first they may appear somewhat startling and burdensome to the pilot first considering attempting to secure an instrument rating. But they are nothing more than the final polish to the education and course of training required of any pilot in order to become a successful instrument pilot. They are certainly much less difficult to master than the airline pilots' problems. He must know all the details of large-scale operations. He must know not only the use of instruments, but radio ranges, analysis of weather, the proper operation of landing flaps, retractable landing gears, gas valves, etc., how to maintain an accurate course from one point to another without seeing anything more than the instrument board, and all this while operating on a precise schedule and giving due consideration to passenger comfort.

The air traffic rules have been issued for one and only one purpose and that is safety, both for the occupants of aircraft and for the people on the ground beneath the aircraft. If this fact is remembered while reading the rules, there should be general agreement that, wordy and legalistic as some phrases may seem, the Bureau has never lost sight of this objective and every procedure or policy indicated is based solidly on a foundation of demonstrated good practice.

GLIDING into the AIRPORT

Many airports cannot expand fast enough to accommodate the increased demands of some of the bigger transports now on the way. With the problem of runway length becoming more acute, a minute examination of the technical aspects of the pre-landing glide is in order.

By Prof. A. H. Blaisdell

Carnegie Institute of Technology

AMONG THE MANY ITEMS of airplane performance which seem to be growing in importance is that dealing with the landing characteristics of such craft. Only recently the Department of Commerce sounded a note of warning concerning the likelihood of many large airports being removed from the regular scheduled stops of the major airlines. The reason is of course the increased landing speeds of the large commercial airplanes which will require runways of increased length compared to those possessed by most of the existing airports. Increasing demands are being made on the pilot's skill when taking off and landing his ship, and it is reasonable to suppose that this situation cannot be allowed to become further aggravated. Growth in wing loadings, up to 30 lb. per sq. ft. of wing area with promise of higher values, accompanied by greatly improved cleanness of design and construction are the principal reasons for this phase of the operational problem, and wing flaps, slots, or other auxiliary devices have by no means provided a satisfactory answer to the difficulty.

The following discussion briefly touches upon an important part of the landing problem; namely, the glide into the airport preparatory to the landing. The several graphs are based upon the flight performance of a low wing monoplane possessing a wing area of 145 sq. ft. Since the aim of the article is of a purely general nature, no attempt is made to introduce specific experimental data.

Experience proves that it is difficult to duplicate, even in an approximate manner, the landing characteristics of an airplane. Variations in approach and speed are probably the principal reasons for this fact. For this reason an analysis must be based on assumed conditions and characteristics which may be considered as approximating to the average of those observed in flight tests. With this limitation in mind, Fig. 1 represents the landing path of an airplane from the time it passes over the airport boundary until the plane comes to rest. In the customary manner the landing is divided into three parts. The distance S1 defines the air run, and is measured from the point where the airplane passes over the field boundary, in a glide at approximately constant speed until fairly close to the run-

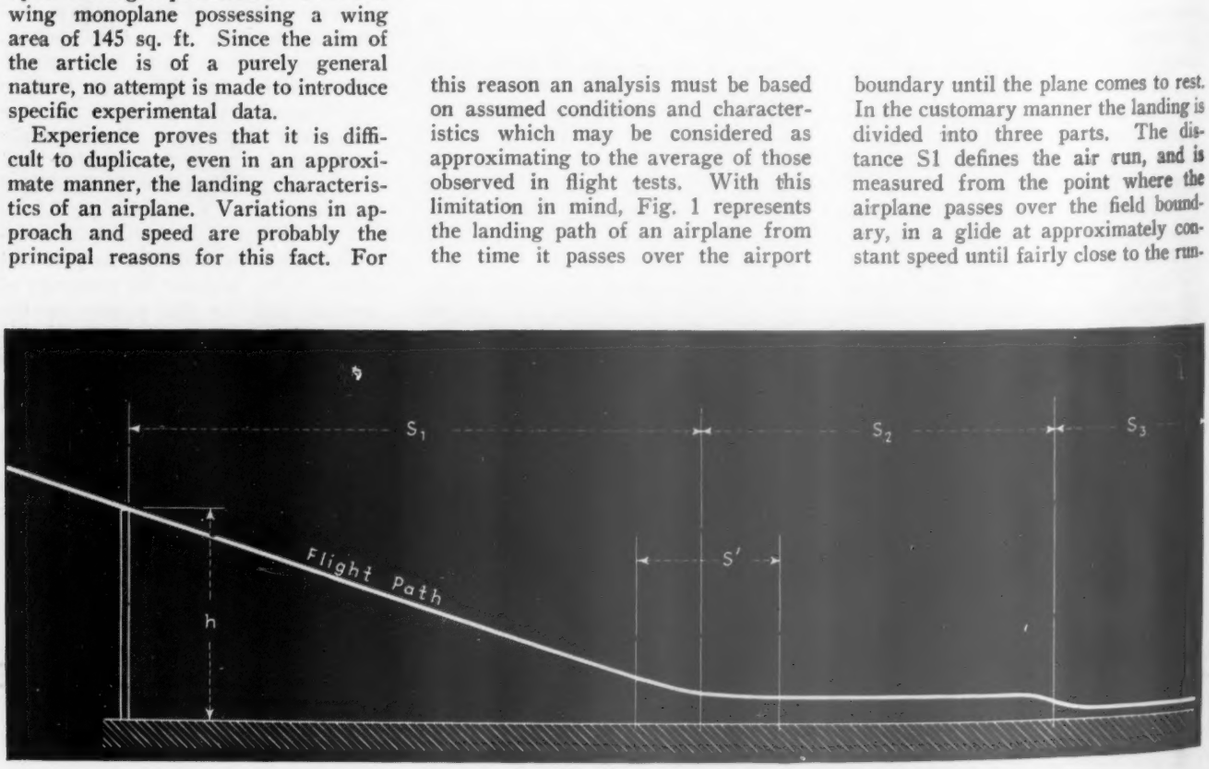


Fig. 1—Airplane flight path from field boundary to point of rest.

way surface when the airplane is leveled off; and if there is sufficient residual kinetic energy from the glide, the airplane may float for some distance S_s with decreasing speed until contact is made with the solid surface and a ground run of S_s feet is made to the point of rest. There is no well-defined demarcation for the transition distance S' between the free glide and the float portions of the landing. This section of the approach path may sometimes be relatively short, and at other times begin before the airport boundary is reached. Still air landing is assumed.

Side slipping, or other maneuvers sometimes employed to land airplanes, are not considered. The obstruction height "h" marks the minimum height at which the airplane enters over the airport boundary.

The Angle of Free Glide

With engine cut out, the forces acting on an airplane in gliding flight may be approximately represented by the vectors of Fig. 2, where L and D are lift and drag respectively, W is the gross flying weight, θ is the angle of glide, and λ is the angle of attack. The arrangement of the vectors indicates that for steady flight, the glide angle "θ" depends on the relation between L and D as expressed by the formula:

$$\tan \theta = D/L = C_D/C_L \qquad (1)$$

From a practical standpoint, it is desirable to make the air run as short as possible without introducing undesirable effects on the remainder of the landing perfomance such as excessive gliding and sinking speeds. That is, the glide angle θ should be as large as possible, and this is seen to depend upon the relation between the overall drag and lift coefficients for a given airplane. In contrast to the above, when approaching an airport it may be desirable, because of engine trouble, to make a flat glide at a small value of θ. Under such circumstances the maximum value of the lift-drag ratio determines the flatness of the free-glide path. In modern airplanes the maximum value of C_L/C_D varies from about 8 to 14, and therefore the minimum free glide angle will range from 4 to 5 deg. for the aerodynamically cleaner airplanes, to 7 or 8 deg. for craft of lower aerodynamic effectiveness. It is evident that the pilot has direct control over the glide angle, since he can vary both C_L and C_D by manipulation of elevators and flaps.

In the present case, we are not concerned with the approach glide, but only with that part of the glide which comes within the immediate environment of the airport, at an angle of attack somewhat lower than the stall angle. The curves of Fig. 3 show, in a general way, how the free glide angle of a low wing monoplane with extended landing gear may vary with the wing flaps neutral, and in their extreme down position. Variations in flap design, and other factors, will cause wide differences in the relative positions of such curves; but their general shape and location will be about as shown. A study of the two curves brings out several interesting facts. First, their shapes are similar, the effect of the flaps being to shift the curve to the right and upward. Secondly, there is a single angle of attack and hence C_L for which θ has its lowest value. For a properly designed flap gear, there should be an appreciable difference between these two values of θ; but in the present instance the wing flaps were not as effective as they might have been, and

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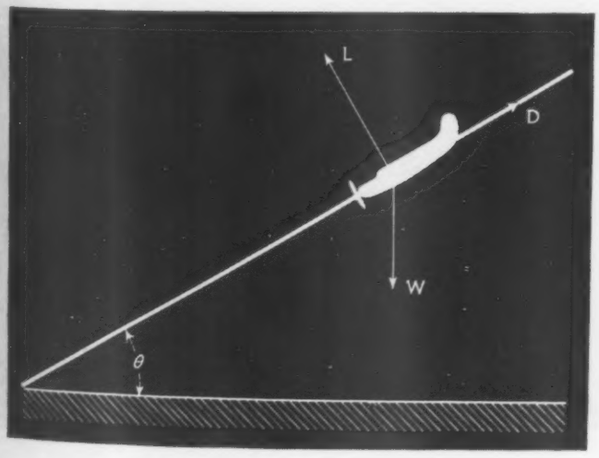


Fig. 2—Forces acting on plane with dead engine.

Fig. 3

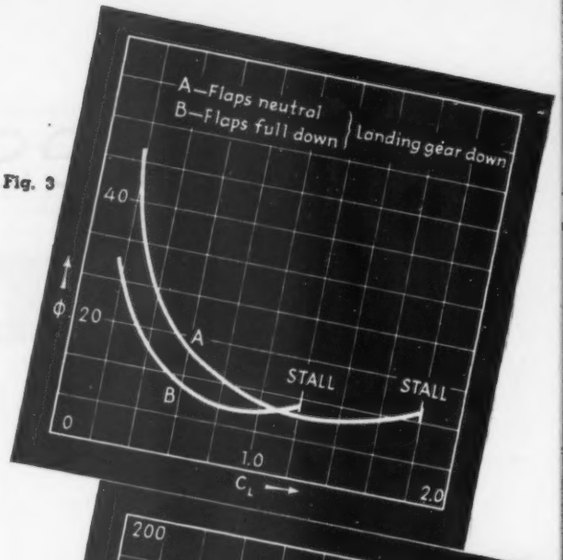


Fig. 4

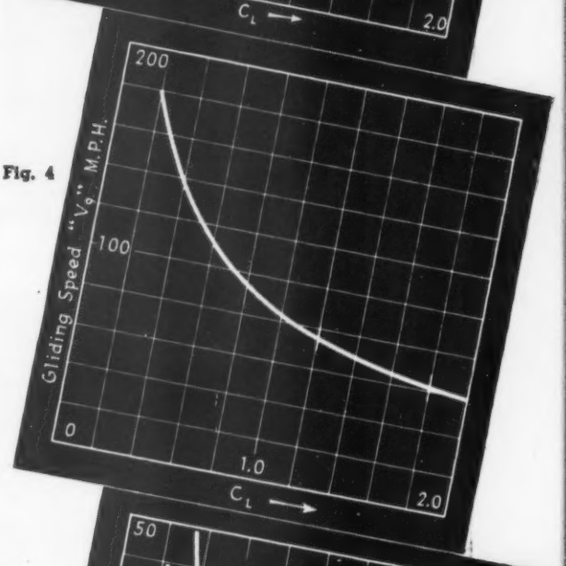


Fig. 5

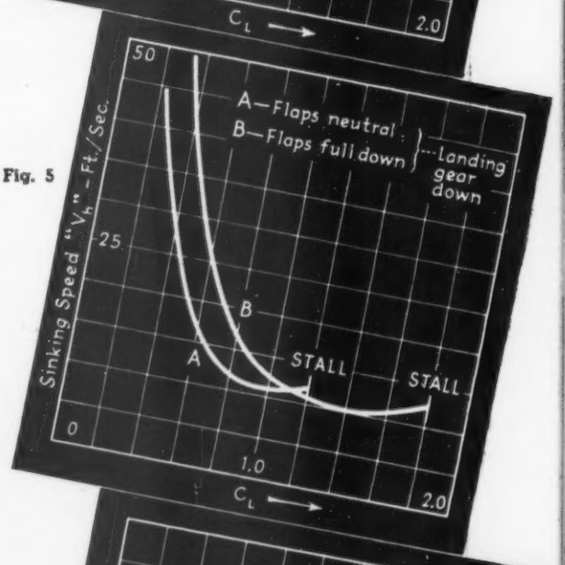
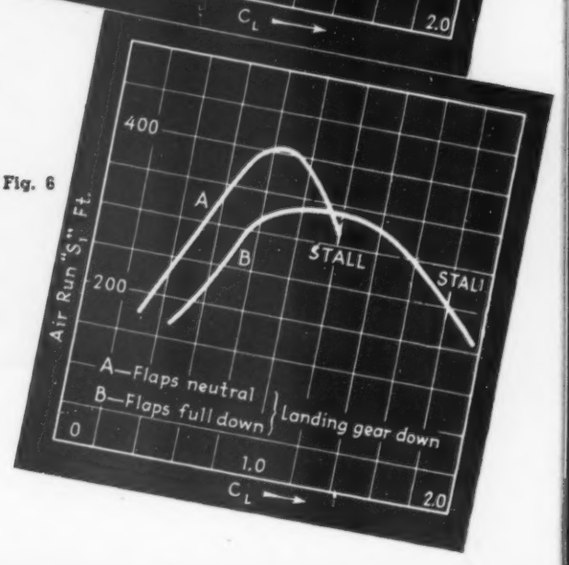


Fig. 6



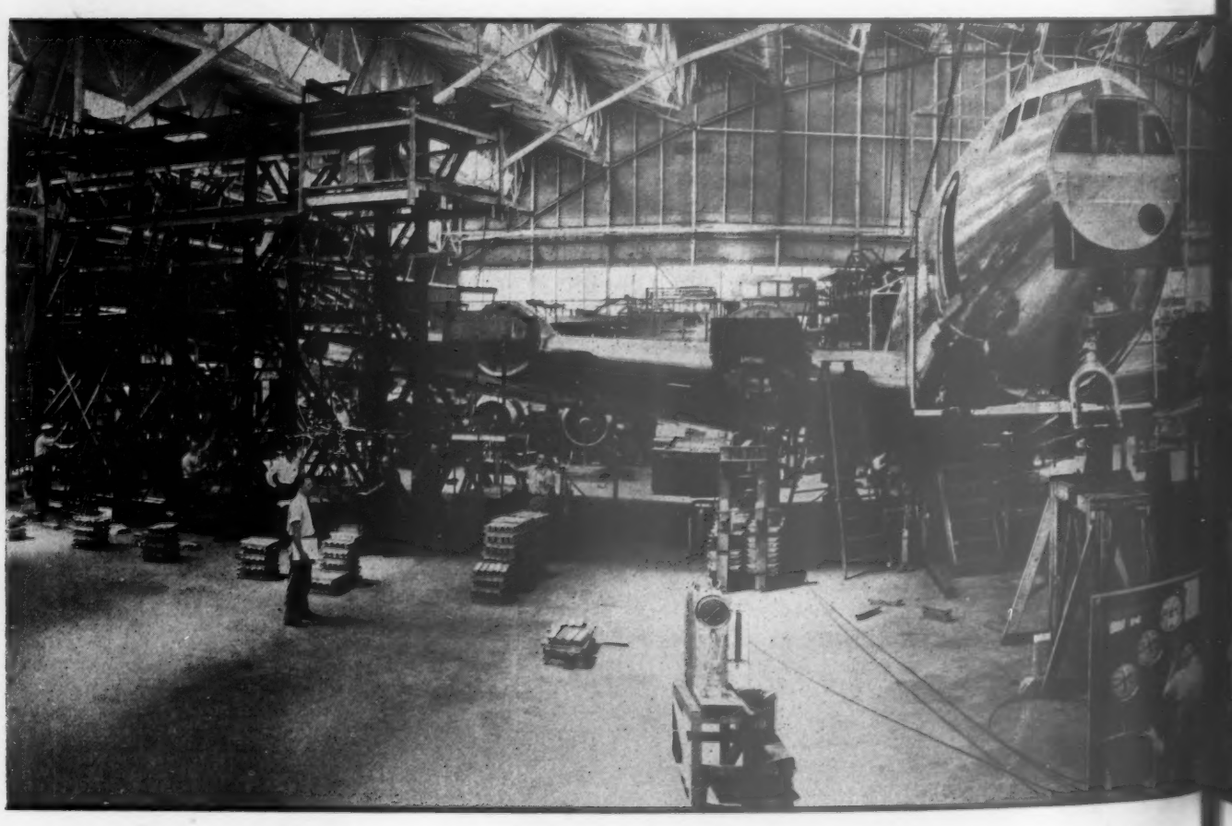
Testing the DC-4

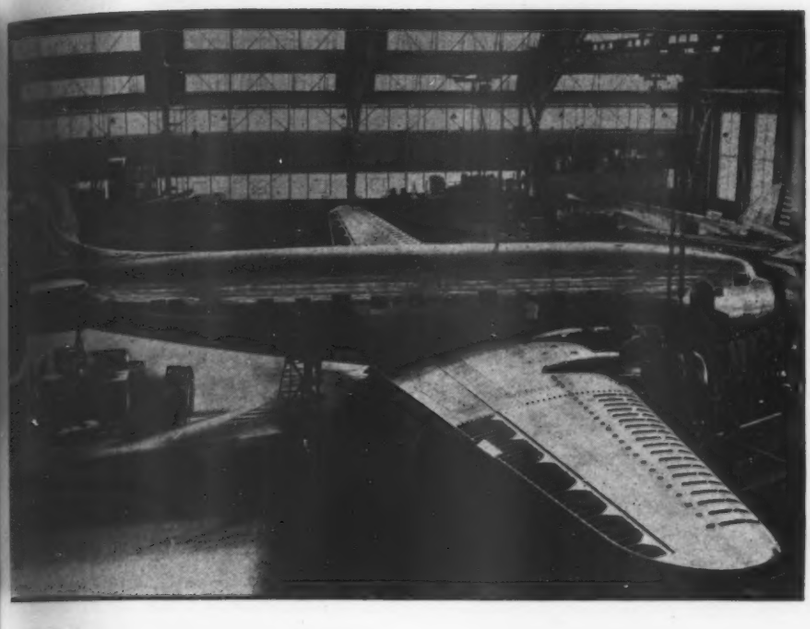
Static testing a ship as large as the DC-4 presented unusual problems. The accompanying shots show how they were solved by the Douglas engineering staff in their Santa Monica factory.

Flying Equipment

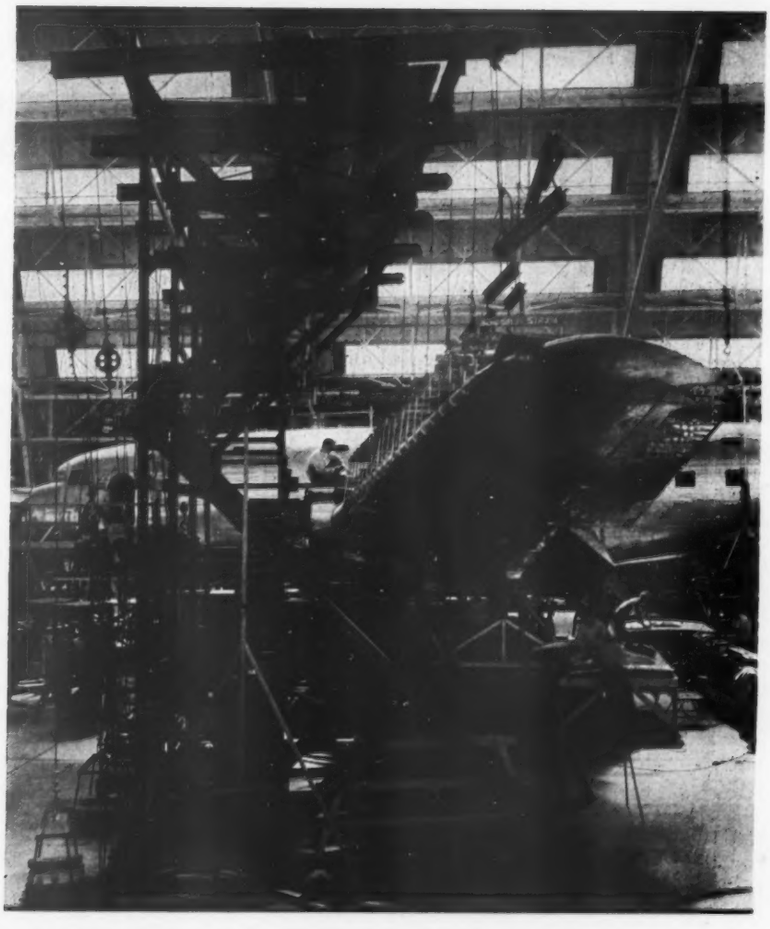
The hydraulic control panel in the foreground (below) was used to adjust the relative pressures of the system of hydraulic jacks used in applying load to the center wing and nacelles. The steel structures at the sides supported the cable system used in applying air loads to the outer wings. In addition to the weights here shown load was simultaneously applied to the tail surfaces and inside the fuselage. The airplane is shown set up for the high angle of attack test, with tail lowered.

An indication of the problems encountered in the production of the new large planes is provided in the pictures to right and left of the ship above. Communication between the cockpit and the tail surfaces during this test was obtained by interphone, the distance (100 ft.) being too great for the normal voice.

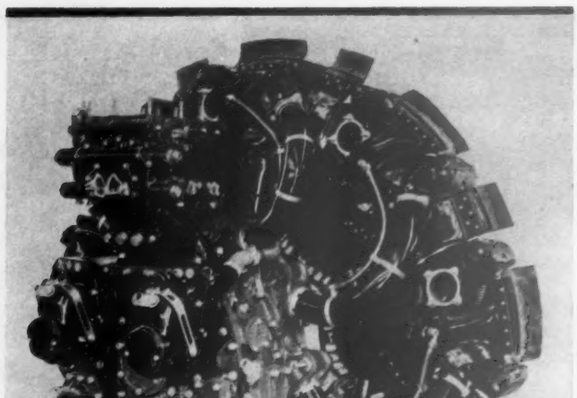




Above: The DC-4 is prepared for testing at Santa Monica. The strips which appear on the upper forward wing surface were used to attach the leverage system for applying lift loads. They were machine-screwed in place and are removable. The ailerons had not yet received their fabric covering when the picture was taken, nor were the rudders in place.



Above: The lifting air loads were applied to the outer wing through a leverage system attached to the upper surface, (as seen in picture) pull being exerted through cables passing over pulleys supported by the steel framework shown. The lift loads on the inner wing were produced by hydraulic jacks acting on the bottom surface.



Flying Equipment

G-100 WRIGHT Cyclones

With Two Speed Supercharger and Chandler-Groves Carburetor Released for Export

EXPORT APPROVAL for the G-100 Cyclone, the Wright two-speed supercharger, and the Chandler-Groves carburetor, with which the engine may be equipped, has been announced by Myron B. Gordon, vice president and general manager of the Wright Aeronautical Corporation. The G-100 Series Cyclone has been in operation for a year on several domestic airlines. First foreign installation is in a Douglas DC-3 for K.L.M.

Basically similar to its predecessor, the G Cyclone Series, the new G-100 embodies many refinements resulting from research and operating experience of the Army, Navy and commercial operators here and abroad. Distinguishing feature of the G-100 is its 1100 hp. take-off rating, its steel main crankcase section and the installation of the Chandler-Groves carburetor. Although the steel crankcase has slightly increased the total weight of the engine, it has permitted a reduction of specific weight by 0.04 lb. per hp. because of the increased output. The new carburetor, in combination with other refinements, has made it possible to retain the fuel consumption of 0.43 lb. per hp. hr. at cruising speeds.

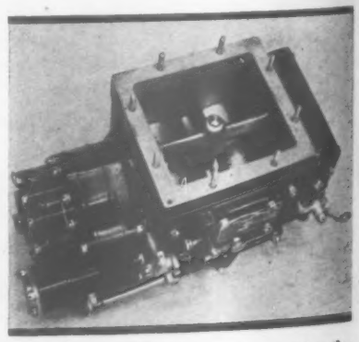
Not only is the Chandler-Groves carburetor impervious to the effects of icing but it also compensates automatically for variation in altitude. Necessity for a large air preheater to prevent ice formation is eliminated and the total weight of the carburetor is several pounds less than that of the usual types.

Included as optional equipment is the Wright two-speed supercharger which makes this power plant virtually two engines in one. Developed by Wright in conjunction with Army Air Corps engineers at Wright Field, this device provides engines with two distinct sets of performance characteristics. The unit increases the weight of the engine by only 10 pounds.

The two-in-one effect is produced by changing the blower ratio or speed of the supercharger. During take-off under heavy load conditions or in flight near sea level, the two-speed supercharger is fixed in the low blower ratio position which enables the pilot to obtain full take-off power. Up to a specified altitude the amount of supercharging made available by the low blower ratio provides maximum performance. After a certain height is reached, the engine may be switched into high blower to produce sea level power at high altitudes. The shift from low to high blower is made by the simple manipulation of one control lever in the cockpit of the airplane.

The G-100 Cyclone, like previous Cyclone Series, is a nine cylinder, static radial, air-cooled engine of 1823 cu. in. displacement. It is furnished in two models, both with a 16:11 propeller speed reduction gearing, which differ from each other only in their supercharger drive gear ratios. The first, the GR-1820-G102, is rated at 1100 hp. for take-off, with 900 hp. available for normal operation from sea level to 6,500 ft. The second, the GR-1820-G103, has a 1,000 hp. for take-off rating, with 860 hp. for normal operation from sea level to 10,500 ft. These power outputs and performances are obtained with fuel of 90 octane number.

Except for its steel crankcase, and improved spring-loaded air seal leathers on the intercylinder and cylinder head baffles, a casual inspection of an assembled Cyclone G-100 would not reveal many strik-



Low fuel consumption is retained by the use of the Chandler-Groves carburetor

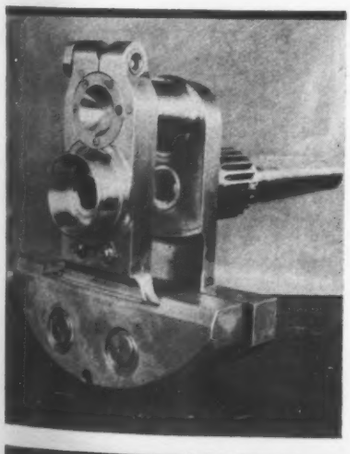
ing outward differences from the preceding G model. In reality, it is nearly an inch larger in diameter. This is to permit the use of a new type of forged aluminum alloy piston, ribbed on the underside of the head for strength and cooling and finned on the inner side walls, which has a longer skirt and uses three compression and three oil control rings. The cylinder barrel was lengthened slightly to allow for the longer piston.

Greater volumetric efficiency of the engine has been provided by improvements in combustion chamber design and that of the intake and exhaust parts. This provides a total cooling surface on the engine equal to a flat area 17 ft. long by 10 ft. wide. This area has been "folded up" on an engine 55 in. in diameter by advanced foundry technique by which cylinder heads with fins 2 in. deep spaced 7/32 of an inch apart can be cast as a production operation.

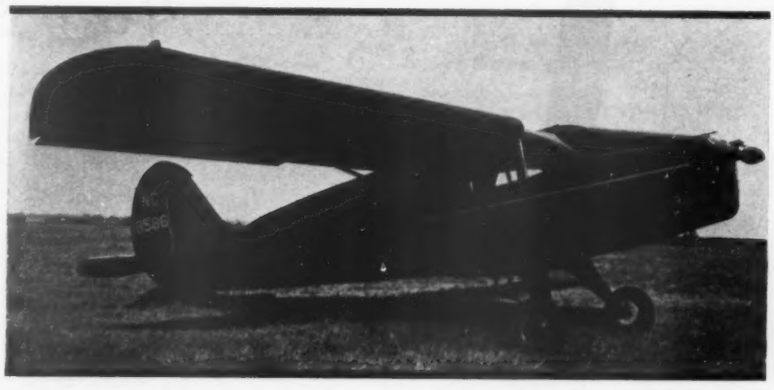
Connecting rod refinements have kept pace with the development of higher horsepowers. In the G-100 Cyclone, a master rod with an "H" section rather than the earlier "I" section shank, together with improved knuckle pins allow a better equalization of stresses between the link rods and the main crankpin bearing. All rods are hand finished with micrometric accuracy and polished to a mirror surface.

As in previous Cyclone models, the main housing section is divided into six segments. The G-100 Cyclone, however, in addition to its steel two-piece crankcase, has a forged aluminum alloy nose section in place of the casting used on all but the later G models. This nose, which encloses the cam mechanism and incorporates the valve tappet guides, also provides for a constant speed propeller governor drive. The drive is so designed that it may be readily removed without the necessity of removing the nose section from the engine. Drilled oil passages in the forging supply the fully internal auto-

(*Turn to page 65*)

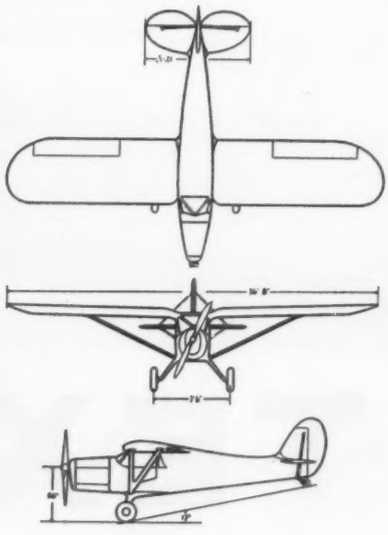


Above: The crankshaft with dynamic damper. Below: Pistons are ribbed on the underside for strength and cooling



SWALLOW Coupe

A SMART LOOKING two place coupe has just been offered by the Swallow Aircraft Corporation of Wichita. The Model C is powered by the Menasco 125 hp. engine. A three place coupe, the Model C-160 (160 hp. Menasco,) will be available for summer delivery.



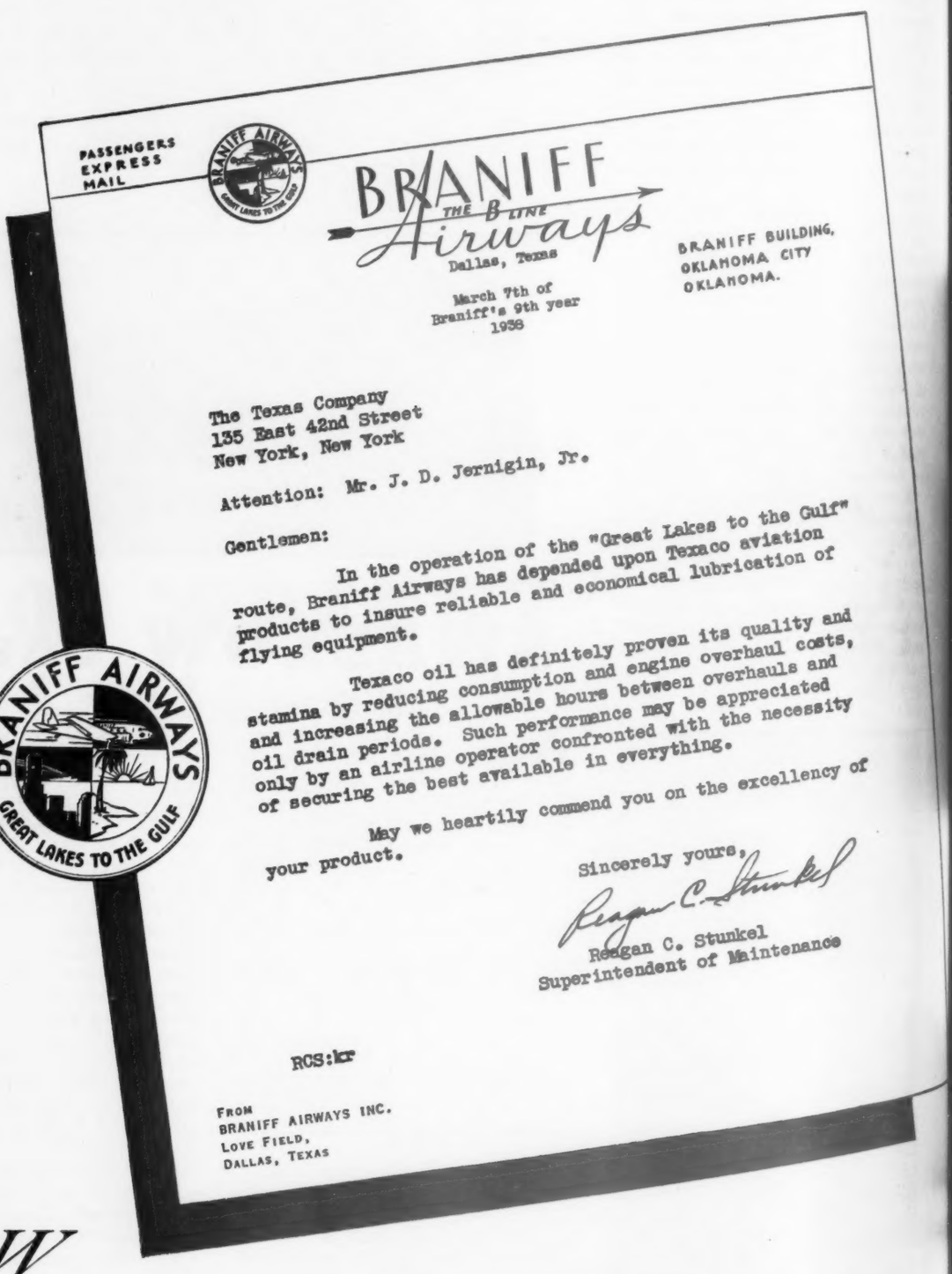
The Model C is of conventional construction with wood and fabric wings and welded chrome molybdenum steel tube fuselage and tail surfaces also fabric covered. Landing gear is of the full cantilever type with shock absorbing mechanism entirely enclosed but easily accessible for servicing. Tread is 7 ft. 6 in. 6.50x10 wheels with brakes are used.

Large windows and a slanting "V" type triangular windshield of safety glass provide excellent visibility over the inverted engine in the nose. A good sized baggage compartment aft of the seat and accessible in flight and glove and map compartment are located in the right side of the instrument panel. An electric starter is standard equipment.

Specifications as furnished by the manufacturer are as follows:

Length overall	24 ft. 4 in.
Height overall	7 ft. 3 in.
Span	36 ft. 8 in.
Weight empty	1350 lb.
Gross weight	1980 lb.
Wing area (including ailerons)	189 sq.ft.
Top speed	145 m.p.h.
Cruising speed	135 m.p.h.
Landing speed	40 m.p.h.
Cruising range	450 mi.
Service ceiling	18,000 ft.

"INCREASING ALLOWABLE H



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March 7th of
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1938

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Sincerely yours,

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Reagan C. Stunkel
Superintendent of Maintenance

RCS:kr

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NEW

TEXACO

TEXACO

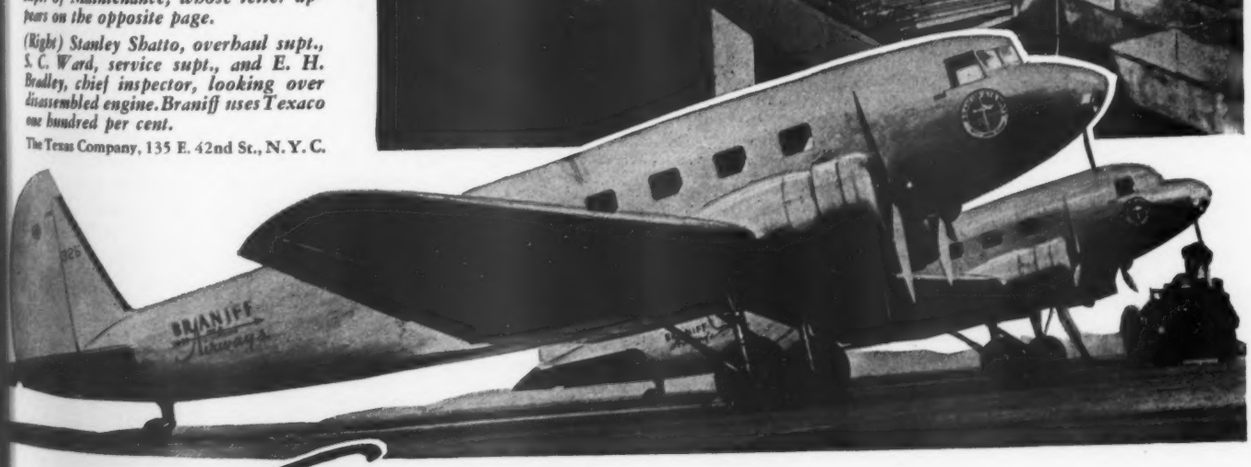
HOURS BETWEEN *overhauls and oil drains"*

Reagan C. Stunkel

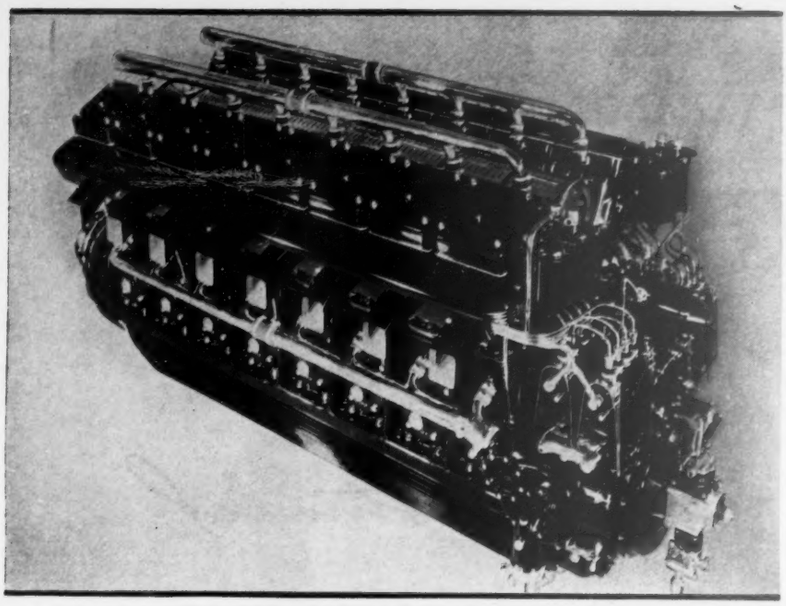
Reagan C. Stunkel, Braniff Airways' Supt. of Maintenance, whose letter appears on the opposite page.

(Right) Stanley Shatto, overhaul supt., S. C. Ward, service supt., and E. H. Bradley, chief inspector, looking over disassembled engine. Braniff uses Texaco one hundred per cent.

The Texas Company, 135 E. 42nd St., N. Y. C.



Airplane OIL



The powerful 1200 hp. Mercedes-Benz DB 602 airship diesel which will be used on the new Zeppelin, LZ-130.

German
AIRCRAFT ENGINES

Continuing a discussion started in AVIATION for May. In this section recent developments in diesel engines for airships and for heavier-than-air machines are covered

PART II

By Paul H. Wilkinson

Author of "Diesel Aircraft Engines"

THE THIRD, or long-range group of engines perhaps is the most interesting of all, inasmuch as it comprises an entirely new kind of power plant. In it are the Diesels, of both two-cycle and four-cycle design, as represented by the products of Junkers and Daimler-Benz respectively. Although for many years these two concerns have produced gasoline engines, they have not neglected their Diesel development and as a consequence, they are now the undisputed leaders in this field. For the high-speed, light weight type of diesel so essential for airplane use, the two-cycle design with its high efficiency and low fuel consumption has been found to be the most suitable. For airships, the four-cycle diesel of slower speed is preferred.

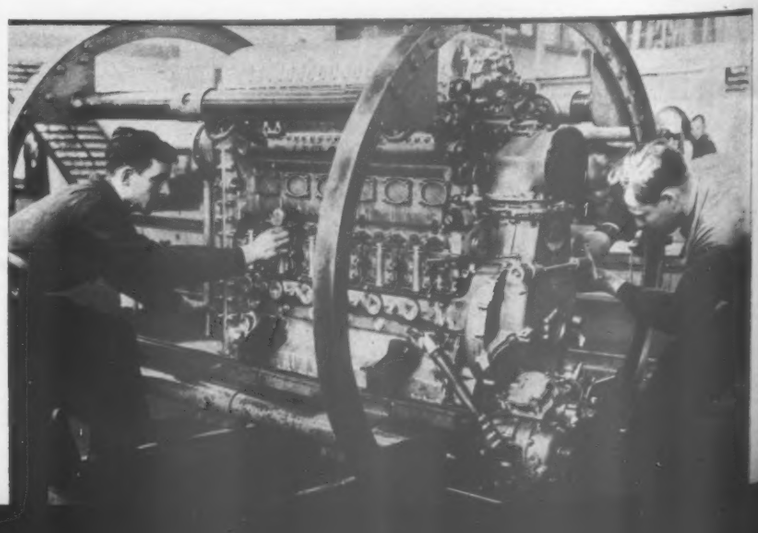
The airplane diesel now in mass production at the Junkers diesel factory at Köthen, is the well-known two-cycle "Jumo" 205 of 1014 cu.in. displacement. The model used extensively on Junkers Ju 86 ten-passenger airliners, and on transatlantic flyng boats and seaplanes, is the "Jumo" 205-C with a rating of 600 hp. at 2,200 r.p.m. and a continuous cruising output of 510 hp. It weighs 1,140 lb., or 1.90 lb. per hp., and has a fuel consumption, under actual operating conditions, of 0.36 lb. per hp.hr.

A later model, the "Jumo" 205-D. is rated at 700 hp. at 2,600 r.p.m. and has a continuous cruising power output of 590 hp., which makes its weight 1.63 lb. per hp. A third model of the same series, the "Jumo" 205-E, develops 800 hp. at sea-level and has a cruising output of 655 hp. at 2,400 r.p.m., which brings its weight down to 1.42 lb. per hp. It is claimed for the last mentioned engine, that it has a consumption of 0.35 lb. per hp.hr.

For commercial use, the "Jumo" diesel is equipped with a gear-driven centrifugal supercharger similar to that used for gasoline engines, which maintains its rated power to an altitude of 8,200 ft. For military purposes, however, the engine is equipped with an exhaust-driven, two-speed supercharger and it is then known as the "Jumo" 207, being credited with a rating of 750 hp. at 20,000 ft. At low altitudes, for ground boost, the centrifugal blower is driven through gearing; at high altitudes, the exhaust-driven turbine is cut in.

Turning to the airship field, the Mercedes-Benz DB 602 diesel (which formerly was called the LOF-6), is well-known for its accomplishments in the Zeppelin-type airship. As it is not supercharged, it is of considerable displacement—5,401 cu.in. to be exact—in order that a rated power output of 1,200 hp. at 1,600 r.p.m. may be obtained at sea-level. Complete with reversing gear, it weighs 4,320 lb., or 3.60 lb. per hp., and has a fuel consumption of 0.375 lb. per hp.hr.

In conclusion, we see that there are three general utility, three high performance and two long-range aircraft engines in production in Germany today. These are the products of four concerns of vast resources and manufacturing ability. In the past, the trend of design has been toward the radial air-cooled gasoline engine for general utility purposes, the inverted-vee liquid-cooled gasoline engine for high performance work, and the in-line liquid-cooled Diesel for long-range flights and bombing missions. As to gasoline power plant development, this has been at least on a par with our own, while their Diesel development has been vastly superior. What the future has in store, no one can say.



A Junkers "Jumo" 205-D diesel on the assembly line. Equipped with a centrifugal blower, it develops 700 hp. at 8,200 ft.

NEW

MARTIN 166 BOMBER

MARTIN

U.S.A.

NEW

STRIKING POWER

THE new Martin Bomber, Model 166, stands out in sharp contrast—even with its famous Martin predecessors. This new model has vastly greater speed, greater range, and proven reliability—in short, GREATER STRIKING POWER. Model 166, the latest and greatest of the world-known bombardment aircraft developed by Martin, is available for export.

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Boeing Graduate Mundy I. Peale, (Class of '30), now with Sikorsky Aircraft, Division of United Aircraft Corp.

On their way — thanks to this CAREER TRAINING

Boeing Graduate Don P. Wilson, (Class of '32), now Sales Engineer, Fairchild Aviation, Inc.

Boeing School of Aeronautics
GRADUATION and PLACEMENT RECORD
(April 1937 — March 1938)

Months	Number Graduated	Number Placements	No. Co.'s Employing Graduates
1937			
Apr.	8	16	6
May	1	16	6
June	34	14	8
July	5	7	2
Aug.	4	2	2
Sept.	20	17	7
Oct.	4	3	2
Nov.	2	2	2
Dec.	29	7	3
1938			
Jan.	7	14	6
Feb.	1	9	7
Mar.	40	16	6
TOTAL	155	123	28

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Oakland, California.

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City _____

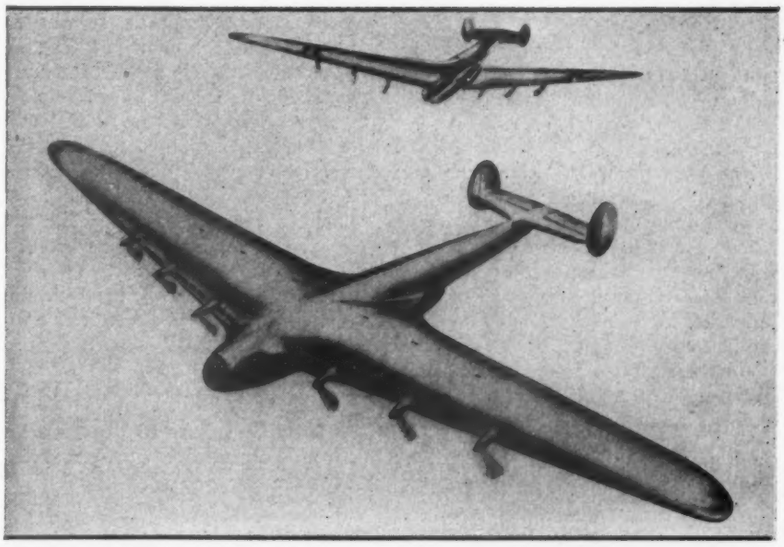
State _____ Age _____

Consolidated Looks Ahead

Engineers have completed a preliminary study of a really big airplane—also, a modification of the PBY.

LOOKING TO THE NEAR FUTURE Consolidated Aircraft Corporation has completed a study of a three hundred passenger plane. Using materials and technique now available, and power plants that would be available by the time such a plane could be completed, the study envisions a single hull flying boat in which outboard floats retract into the under side of the wing, and the main float retract up against the body of the plane. Power is furnished by six two-thousand horsepower engines within the wing driving three-blade propellers of 20 ft. diameter through extension shafts. All passenger accommodations are on one deck which extends approximately 88 ft. fore and aft in the hull and 116 ft. laterally through the wing, with windows in the leading edge and sky lights in the upper surface of the wing. Wing thickness at the root is a maximum of over eleven feet, with a root chord of 48 ft. and a tip chord of 14 ft. Span of the ship is 272 ft., length 144 ft., height 20 ft., wing area 8400 sq. ft., gross weight 400,000 lb., wing loading 47.7 lb. per sq. ft., power loading 33.3 lb. per h.p., total power 12,000 h.p., cruising speed 300 m.p.h. and range of 5000 mi., with a crew of thirty, three hundred passengers, baggage, mail and express.

Latest version of the Consolidated PBY being offered to the world market is an amphibian with retractable tricycle landing gear. As a military patrol bomber it would retain practically all features of the PBY boats as used by the U. S. Navy, plus the ability to operate off land fields. As a commercial transport it would provide accommodations for approximately forty passengers in four separate compartments. Rumors are current of interest in this model for export.



Above: As Consolidated's engineers envision a 200-ton flying boat for the future Main central float is designed to retract against fuselage bottom. Below: The familiar PBY modified to become amphibious.

Flying Equipment

Aircraft Radio

New Equipment for Communication and Navigation by Don Fink

Transcanada Installs Radio Range Equipment

Adopts U.S. air navigation methods and orders equipment from Radio Receptor of New York.

AMONG THE NEW EQUIPMENT going across the border to Transcanada Airways are new radio range beacon transmitters manufactured by Radio Receptor Company of New York. The equipment consists of a transmitter, a goniometer for feeding the antenna system in the proper amplitude and phase, remote control panels, and tuning houses.

The transmitter is designed to operate either with 150 or 400 watts power output, keyed or voice, into any antenna who characteristics are specified. The mechanical arrangement of the rack-and-panel assembly is such that the heavier components are at the bottom, the lighter at the top. All tubes are mounted in a central compartment to assure good ventilation and a minimum of heating of other parts. The rack consists of five shelves, the first containing the power supply and rectifier, the second the three audio stages and the modulator tubes, the third the bias supply, master oscillator, buffer amplifiers, crystals, etc. The fourth shelf contains intermediate and final power amplifiers. On the fifth are the antenna tuning elements.

The goniometer unit is used to transfer the radio frequency power from the transmitter to the transmission lines of each tower in the antenna array. Essentially it is a variometer, whose primary can be rotated within two or more secondary coils. The rotation controls the amplitude and phase of the power delivered to each of the transmission lines, while at the same time reflecting a substantially constant load to the transmitter. The transmitter is fully equipped for simultaneous radio-range operation.

Lear Developments

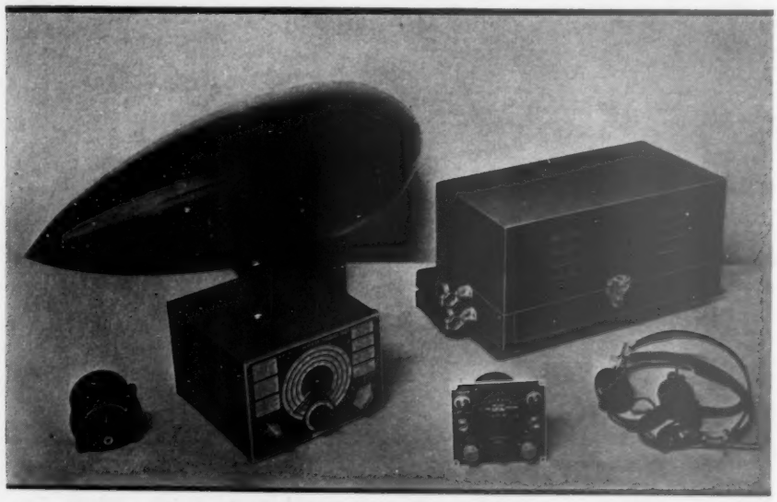
In New Quarters at Roosevelt Field, Announces Compass, Transmitter

ON THEIR FIRST VISIT to Bill Lear's outfit since his move to Roosevelt Field, the radio editors got an eyeful of new aircraft radio equipment. Bill's new place is one of the neatest plants devoted exclusively to aircraft radio manufacturing and service that we have seen. Located in Building 31, the interior of the new plant is finished completely in white, is air-conditioned, and contains a prominently displayed motto "Let us daily strive for perfection, ever mindful that *lives* will be dependent on the quality of the work we do today." Which is not a bad motto for men who build radio equipment for aircraft.

Among the new apparatus now in production is the UT-6 six-frequency transmitter, a 20-to-30 watt unit weighing but 27 pounds, completely installed. The transmitter is tuned automatically, by a motor driven switch mechanism, to any of six preselected frequencies. Four beam-type tubes are used: a 6L6 crystal-controlled master oscillator, two 6L6-G push-pull modulators, and an 807 power amplifier. The dynamotor power supply is mounted integral with the chassis base, and is supplied in two sizes. The normal installation delivers 20 to 30 watts, depending on the battery voltage and the antenna loading. A dynamotor with a somewhat higher voltage and power rating delivers from 25 to 40 watts, the increase in power being obtained without any other changes, and involving only one-half pound extra weight.

The tuning control is mounted directly on the control panel, as shown in the illustration. The tuning switch actuates a small motor which drives a rotary switch mechanism. The switch points are connected to taps on the tuning inductors, and to each of the separate crystal circuits, switching both m.o. and p.a. circuits simultaneously. All the tuned circuits are pre-set at the factory, the only adjustant required of the operator being antenna matching. Maximum power output is indicated by the change in plate current of the 807 power amplifier, on a meter mounted on the control panel. In operation, the pilot selects the desired frequency, and then, if a trailing antenna is used, reels the antenna in or

(Turn to page 45)



Lear radio compass equipment, with radio frequency circuits in separate compartment

VULTEE
World-wide demand for Vultee Long Range Attack Bombers built this ultra-modern aircraft factory, recently doubled in size! Here, outstanding engineering talent and precision production methods go hand in hand to produce a military airplane of outstanding offensive and defensive characteristics. Because it meets the demands of modern military tactics most efficiently, world powers have found in the Vultee V11-GB the answer to their air armament problems.
Vultee
VULTEE AIRCRAFT (Div. of Aviation Mfg. Corp.) DOWNEY (Los Angeles County) CALIF.

Here's the latest of a long line of brilliant Voughts ... the SB2U-2. Fifty-eight of these scout bombers will join the Navy this year... bringing new lustre to a famous name.

CHANCE VOUGHT AIRCRAFT

One of the four divisions of

UNITED AIRCRAFT CORPORATION

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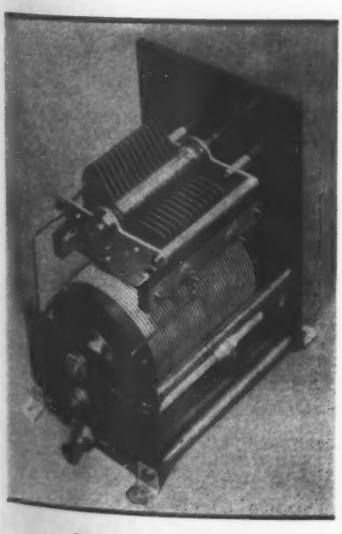
(*Continued from page 42*)

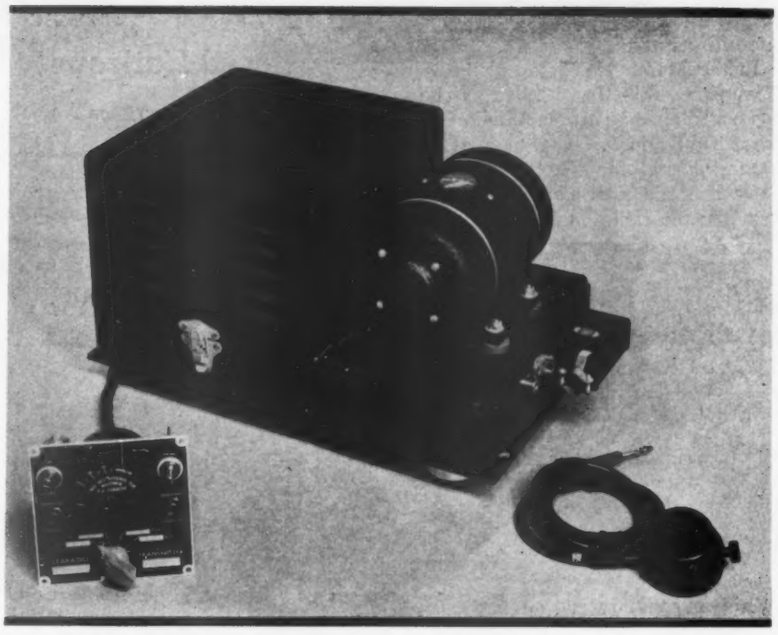
out until the position of maximum output is obtained.

If a fixed antenna is used, a very ingenious antenna loading circuit is available for resonating the fixed antenna to the transmitter output. The condenser, as shown in the photograph, is fixed in tuning, but may be adjusted if necessary. Tuning is obtained by rotating the entire inductor coil, which consists of heavy, spaced wire. On this wire rides a small grooved wheel, which establishes electrical contact with the coil. As the coil is turned, this wheel progresses along the length of the coil, increasing or decreasing the inductance, depending on the direction of rotation.

The latest Lear radio compass, model ARC-5, represents a new departure in that no remote control cables are used. The tuning circuits (r-f and mixing circuits for both loop antenna and vertical antenna) are contained in one small housing, on the panel of which are the antenna selector switch, the band selector switch and the tuning dial. This unit is highly flexible: it will operate with loop antenna alone (for aural-null direction finding and anti-static reception), with vertical antenna alone (communication only), and with both loop and vertical antennas (visual indicator direction finding). The tuning ranges include 200 to 400 kc., 500 to 1030 kc., 1020 to 1700 kc. (on which the receiver may be used for communication or direction finding), and 2800 to 7300 kc., used for communication only. Complete instructions for the use of each band and each antenna connection are printed on the control panel, where they are clearly visible at all times.



Antenna tuning unit



Motor-tuned six frequency transmitter, a recent Lear development

The control of volume and sensitivity of the receiver is provided from a separate control panel, usually mounted near the tuning unit. On this panel are jacks for connecting the phones, switches for selecting automatic or manual control of volume, and a switch for bringing into action a beat-frequency oscillator for cw. reception. Two control knobs regulate the volume in the headphones and the sensitivity of the visual indictor. Also mounted on this panel is a meter for indicating a-v-c voltage. This meter serves the purpose not only of a tuning meter, but also gives relative signal strengths of different stations or of one station as the plane approaches it.

The indicator oscillator circuits, intermediate frequency amplifiers and audio amplifiers are contained in the main receiver housing, which may be mounted wherever convenient. The loop is mounted in a stream-lined housing, and can be supplied in either fixed or rotatable mounting. The leads from loop to tuning unit may be as long as 22 feet. The weight, completely installed, is 40 pounds.

Bureau Publication

Recent Publications from the Bureau of Air Commerce

AMONG THE RECENT REPORTS of the Safety and Planning Division of the Bureau of Air Commerce are two which have to do with ultra-high frequency experiments for traffic control and for radio range beacons. The traffic control work (reported by W. E. Jackson and J. C. Hromada) has been in progress for the past year at the Indianapolis airport. A 100-watt transmitter, operating at 125 megacycles and capable of modulation either by voice or by i.c.w. has been used with a vertical half-wave antenna located about 50 feet above the airport. Two planes, a Waco and a Bureau plane NS-62, were equipped with crystal-controlled receivers.

Flight tests indicate the reception was reliable at all times over distances up to and including the "line-of-sight" between the plane and transmitter. Reception slightly beyond this "optical" distance was possible at flying levels less than 1000 feet, whereas at higher altitudes reception was feasible considerably beyond the optical limit.

Also at the Indianapolis airport as reported by J. C. Hromada, is a 100-watt 63 megacycle four-course radio range transmitter modulated at 1020 cycles, and keyed in the conventional A-N manner. The antenna system consists of four vertical radiators, each about one-half wavelength long. The results have been highly successful. On-course signals are steady, no multiple course have been detected, the cone-of-silence is definite and completely "dead", the reception is free from static effects, and the cost of the installation is but a fraction of the

cost of a low-frequency range, perhaps one-fifth as great.

In the March 15th issue of the Air Commerce Bulletin, Reeder Nichols has contributed an article "Radio Compass Navigation". The article "has been prepared for the benefit of the non-technical pilot-navigator, rather than for the radio engineer."

"Panoramic Reception"

Makes Possible New Type of Radio Compass

INFORMATION received by the editors from Marcel Wallace, consulting electrical engineer of New York, reveals a new system of radio reception by which a cathode-ray indicator may be used for radio compass indications on several stations simultaneously. Among the possibilities are the establishment of signal contours having any predetermined path over the terrain, so that the pilot may follow a "plotted" course with his radio compass.

The basis of the system is a receiver which is rapidly tuned from one end of a given band of radio frequencies to the other, by means of a motor-driven tuning condenser rotating, say, thirty times per second. The output of the receiver is applied to the vertical deflecting plates of a cathode-ray tube, while the horizontal deflecting plates are fed with a sweep voltage which has the same rate of sweep as the tuning condenser is rotated. Consequently on the fluorescent screen of the cathode-ray tube, there appears a horizontal straight line, representing the axis of frequency, and on which is superimposed small vertical "humps" representing the stations received within the band. The height of these humps indicates the signal strength of the station, while their position on the horizontal line indicates their frequency.

If such a receiver is fed from a loop antenna, and if the loop terminals are periodically reversed (as they are in the conventional visual-indicator compass) and if the connections to the vertical deflection plates are reversed at the same time, then the "humps" on the tube will be above or below the horizontal line, depending upon whether the signal is arriving from the left or right. By employing two stations whose frequencies change periodically, and by using directive transmitting antennas whose directivity can be controlled, it is possible to guide the plane over a complex path, simply by following contours of equal frequency between the two stations.

Legal Horizons

(*Continued from page 25*)

of the road being subject to judicial review or determination, and the consent of the municipal authority being necessary to obtain a location in a city. Now it is necessary that a certificate shall be granted by the railroad commission that public convenience and necessity require the construction of the road."

In 1920 the Congress passed what is now known as the "Transportation Act" giving the Interstate Commerce Commission the power to issue or deny certificates of convenience and necessity to the railroads. It undertook to develop and maintain for the people of the United States an adequate railroad system. It recognized that preservation of the earning capacity and conservation of the financial resources of the individual carriers is a matter of national concern; that the property employed must be permitted to earn a reasonable return; that the building of railroad lines involves a waste of resources and that the burden of this waste eventually falls upon the public; that competition between carriers may result in harm to the public as well as in profit; and that when a railroad inflicts injury upon its rival it may be the public which bears the loss.

The same thing applies to airplanes. Public convenience and necessity has been defined as a strong or urgent public need. You can readily appreciate that the operation of a modern airline today has necessitated larger and larger investments to the extent that protection from competition and protection from political caprice must be sought. There is no doubt but that if a transport company felt secure of its route and could be guaranteed under the law the permanency of that route, many of the things it now begs from the Government would be done with his own capital with much the same confidence that a property owner would improve his property to a much greater degree than one who rented his property on a short term lease.

It is interesting to note that the American railroad problems, even with the control of the Interstate Commerce Commission, over-extended and entered into ruinous competition, one road with another, due to a reluctance on the part of the Government to approve obvious needed consolidations, and lacking the vision and courage to deny certificates to new applicants. In this problem, of course, has been involved the one of labor. It is interesting to note that England recently consolidated its railroad system of some 140 companies into 4 systems. In this country there are easily six or seven hundred independently operating roads. Judging from the griefs and mistakes suffered by the railroads in the United States, it would appear best for the future welfare of air transport systems that route monoply be favored under certificates of convenience and necessity, as opposed to the only other economic alternative of Government ownership.

Now, a closing thought on international law. Air has been nationalized all over the world except in the United States. Internationally, it is a fact that the sovereignty owns and controls the air above its domain. As witness to this fact, you see the functioning of customs, immigration officials, and agricultural officials at our airports of entry on the Canadian and Mexican borders. Any United States citizen wishing to fly over Canada, England, France or any other foreign country must first obtain permission through our State Department from the Governments of the countries concerned. Otherwise the country whose permission had not been obtained would protest to our State Department the violation of its sovereignty regarding the aviator who would be so bold or ignorant as to attempt a flight without proper permission whether he intended to land or not. This being a fact, the United States is then the only country that has not taken legal possession of the air above its territory. The situation today is that the Federal Government takes jurisdiction of the air as opposed to the States themselves, but only when interstate commerce law and custom is invoked.

An effort will be made to solve some of these troublesome questions on May 23rd by a technical committee of aerial legal experts composed of the leading nations. This meeting will be held in Paris. Another conference will meet on Private Air Law in Brussels in September.

It has been said that American commercial aviation owes its world supremacy to the fact that it was not militaristically controlled and it has not been over-regulated. To this I subscribe, but also I insist its future growth must not only be diagnosed, but properly and fully surveyed. Let's lay the legal tracks of the air. We'll need them.

WRIGHT Powered THEN and NOW

1928

Wright Whirlwind engines powered Eastern Air Lines' first fleet of airplanes—Pitcairn Mailwings—operated on the 792-mile U.S. Air Mail route from New York to Atlanta, Georgia.

1938

Wright Cyclone engines power all of the luxurious Douglas DC-2 and DC-3 airliners of "The Great Silver Fleet" operated daily between New York, Washington, Jacksonville, Miami; Chicago, Atlanta, Miami; New York, New Orleans, Houston, and other major cities of the South and Middle West. Eastern Air Lines also makes 14 round trips daily between New York and Washington.

May 1, 1938, marks the 10th Anniversary of Eastern Air Lines, now famous for its "Great Silver Fleet" of Douglas airliners powered by Wright Cyclone engines.

In the brief span of 10 years, Eastern Air Lines has grown from a small air mail route, extending from New York to Atlanta, Georgia, to a great airline network serving America East of the Mississippi and Southwest as far as Houston, Texas.

"The Great Silver Fleet" now serves 16 states along 3443 miles of air routes. Nearly 200,000,000 passenger miles have been flown to date in Cyclone and Whirlwind powered equipment, with an unparalleled record of safety.

Congratulations, Eastern Air Lines, on your magnificent record. Wright is proud to have played a part in the growth of your great air transportation system.

WRIGHT AERONAUTICAL CORPORATION
Paterson New Jersey
A Division of Curtiss-Wright Corporation

EASTERN Air Lines

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

New Inert Gas

Ingas has many uses in Aviation Industry

DISTRIBUTION OF INGAS, a new type of economically produced inert gas has been placed in the competent hands of O. J. Whitney, Inc., 9 Rockefeller Plaza, New York. The Ingas system was developed by the U. S. Fire Protection Company of Hoboken, N. J., and has been used extensively in other industries where fire hazard is an important consideration. Most remarkable feature of Ingas is its low cost of production which is approximately 20 cents per thousand cu. ft. on your premises.

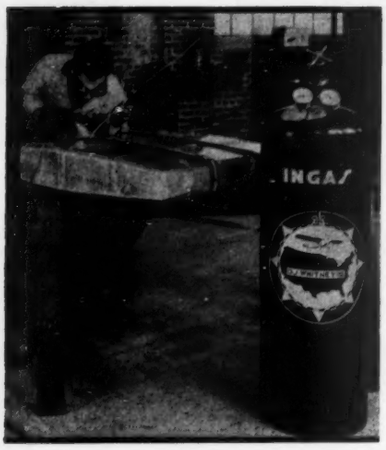
Composition of nitrogen 87 per cent and carbon dioxide, 13 per cent, is accurately controlled by a patented analyzer which operates continuously and admits gases only of the specified characteristics to the storage tanks. Ingas is non-toxic and can be forced into a closed space such as a hangar without injury to the occupants. The gas may be piped to outlets having fusible plugs for automatic release or to hoses at gasoline hose connections. Some other uses of Ingas are:

In place of compressed air for washing down motors.

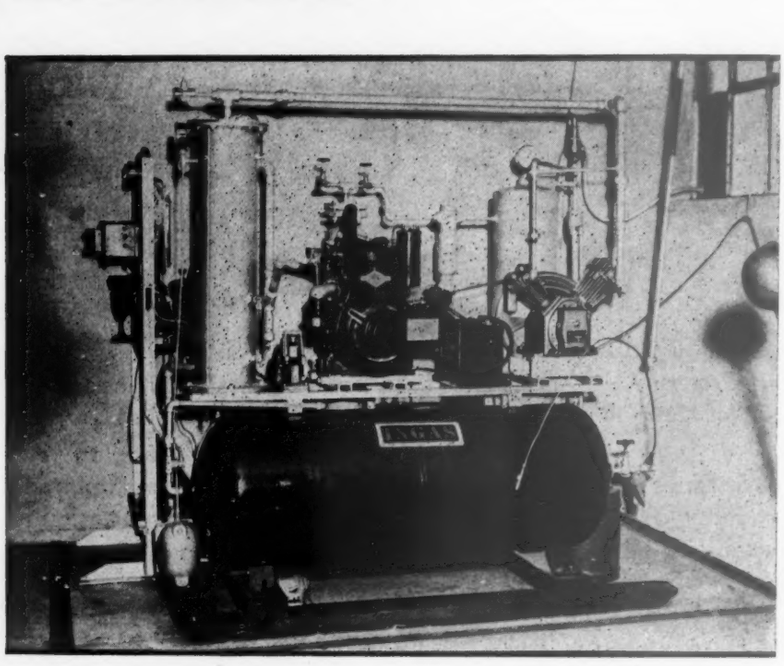
Dispensing gasoline by the displacement method.

Welding gasoline tanks and drums.

The gas is available in bottles and in hand fire extinguishers. Many other uses will present themselves—AVIATION, *June, 1938.*



The Ingas System of inert gas production. Welding a gasoline tank with Ingas Protection.



Thor Drills

Designed for aircraft production work

DESIGNED AND BUILT especially to meet the requirements of aircraft production, the Thor ¼-inch "Aircraft" electric drills offered by the Independent Pneumatic Tool Co., Chicago, Ill., have many features of value for such work. They are extremely light in weight being built with housings of cast magnesium alloy, yet are of rugged construction. Ease of control is enhanced by the generous pistol grip and balanced mounting of the drill, as well as the handy trigger control. The "Aircraft" drills are said to develop about twice the power of ordinary production drills of similar rating. Known as models U121 and U122, the "Aircraft" line incorporates the Thor triple-insulated hand-formed armature and commutator, oversize, precision ball-bearings with steel liners, helical, alloy-steel gears, over-capacity brushes, ¼ in. Jacobs chuck, and mementary side-switch handle that can be locked for continuous operation of the drill.—AVIATION, *June, 1938.*

Independent Pneumatic Drills

Improved Lux Control

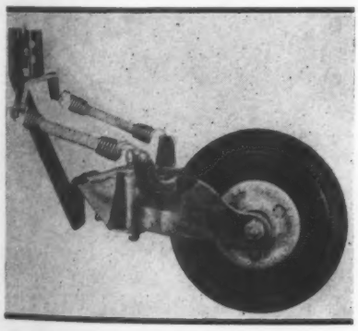
Hand wheel gives better grip and more leverage

AN IMPROVED HAND WHEEL CONTROL for the Lux type fire extinguisher is being offered by Walter Kidde & Company, Bloomfield, N. J. Said to be a definite improvement in the design of the control wheel on operating valves of seat type extinguishers, the new hand wheel gives a better grip and more leverage. It is provided with a pull-out pin which is kept in tension at all times, assuring positive sealing, and making premature operation due to vibration impossible.—AVIATION, *June, 1938.*

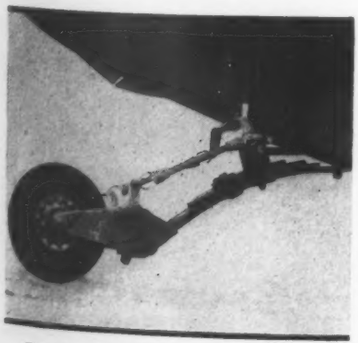
Auxiliary Tail Wheel

For light aircraft Announced By Aircraft Associates

PIONEERS in the development of auxiliary steerable tail wheels for application to popular types of light aircraft, Aircraft Associates, Inc., of Long Beach, Calif., has announced a new heavy duty model steerable tail wheel for planes in the heavier brackets among light aircraft, including Rearwin, Ryan, Monocoupe, Cessna, etc. The new wheel set is available in two tire sizes, of six and eight inch diameter, pneumatic. The tail wheel is easily attached to any standard type tail skid, whether of tubular or steel leaf design. Weight approximates 4 to 5½ pounds. A feature of the unit is flexibility in steering through use of a rubber shock cord linkage between the rudder post control arms and the wheel yoke. This feature protects the rudder and rudder control mechanism from damage which might otherwise result from sudden contact of the wheel with an obstruction on the field. Use of the steerable tail wheel is said to make light aircraft much more easily controllable in taxiing under varying wind conditions, reducing use of engine and making it unnecessary for a helper to guide the plane by a wing tip during cross wind taxiing.—AVIATION, *June, 1938.*



For Rearwin, Ryan, Monocoupe, Cessna



For Rearwin Models 7000 and 9000

Improved Acetate Plastics

New Bakelite formula based on years of research

A NEW LINE of acetate molding materials is announced by the Bakelite Corporation, New York, N. Y. Adapted to both compression and injection molding, the Bakelite acetate plastics are thermoplastic molding compounds with cellulose acetate base, manufactured in granular form in a wide range of colors, including crystal clear, black, and variegated mottles, as well as transparent, translucent and opaque colors.—AVIATION, *June, 1938.*

Link Model D

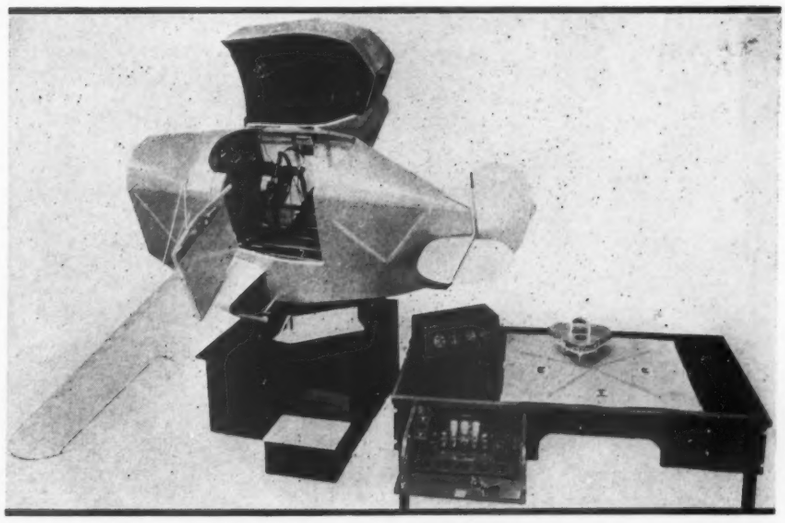
New Trainer for Use with Lorenz System

THE MODEL D LINK TRAINER has been developed largely for European use with the Lorenz Landing System substituted for the radio range stations. In order to effectively use this system it was found necessary to supply certain instruments in duplicate for the more convenient use of the instructor.

To accomplish this three instruments, air speed, rate of climb, and sensitive altimeter, are made to operate by remote control on the instructor's desk, these instruments being synchronized with those in the pilot's cockpit. In addition there is a duplicate set of the Lorenz flight path indicator, one in the cockpit and one on the desk.

By reading the instruments and also by following the course of the trainer as traced by the automatic recorder, the instructor is able to convey to the pilot under the hood his position both as regards his flight path and his altitude by manually operating the Lorenz Flight Indicator. Thus, instrument landings under the hood using the Lorenz System, are readily accomplished.

It should be noted that a complete set of regular flight instruments are included in the D Type trainers, thus permitting instruction in instrument flying. The radio compass is replaced by the vertical hand of the Lorenz indicator and can be utilized by the operator in homing device problems.—AVIATION, *June, 1938.*



Link Model D Trainer and Instructor's Desk

Go **DOUGLAS** *All the Way*

From journey's beginning to end your itinerary can insure Douglas speed, comfort and security on all five continents. When change of planes is necessary, it is satisfying to step from one Douglas into another. This universal service is made possible by airline recognition of the economy and efficiency of standardizing on Douglas equipment plus the preference of passengers for Douglas airplanes. Note below the connecting airlines throughout the world that standardize on Douglas transports.

DOUGLAS AIRCRAFT CO., INC., SANTA MONICA, CALIFORNIA

FIRST AROUND THE WORLD

"GO DOUGLAS" ALL THE WAY ON THESE WORLD-WIDE AIRLINES

NORTH AMERICA: American Airlines Inc. . . Braniff Airways . . Eastern Air Lines . . Pan American Airways . . T. W. A. . . United Air Lines . . Western Air Express . . Wilmington-Catalina Airline • **SOUTH AMERICA:** Pan American Airways . . Pan American Grace Airways • **AUSTRALIA:** Airlines of Australia . . Australian National Airways • **EUROPE:** A. B. Aerotransport, Sweden . . Air France, France . . Avio Linee Italiane, Italy . . K. L. M ,Netherlands . . C. L. S., Czechoslovakia . . L. A. P. E., Spain . . L. A. R. E. S., Roumania . . LOT, Poland . . Swissair, Switzerland • **ORIENT:** China Nat'l Aviation Corp. . . K. N. I. L. M. in Netherlands Indies . . Japan Air Transport

THE AVIATION NEWS

REVIEW, COMMENT, FORECAST

DANIEL SAYRE
C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. R. Lockin, *New York*

JUNE 1938

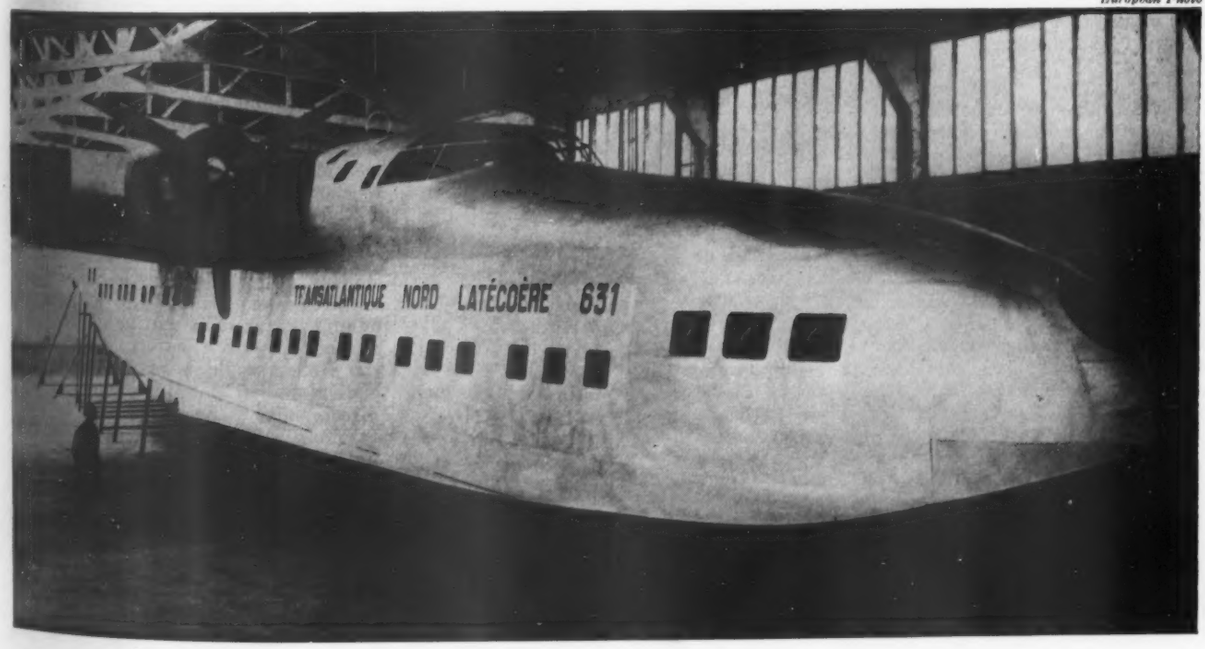
Congress Gets to Work on Air Law

(Story on page 52)

Wide World Photo

TRANS-ATLANTIC ARRIVALS: Above—Dr. Hugo Eckener, to plead against the helium embargo. Right—The British Commission to look over our military factories. Reading up the gangplank F. Rowarth; Air Commodore J. G. Weir; C. E. Horrex; A. T. Harris and Caspar John. Below—First photo of the mock-up of Latecoere's latest trans-Atlantic flying boat. Gross Weight: 66 metric tons.

European Photo



Senate Votes Amended McCarran Act
House Passes Lea Bill After Changes
Compromise Up To Joint Conference

Number of Commission Members, Limits of President's Say-So, Main Points of Difference as Air Legislation Hits Last Lap

WELL, AT LONG LAST, the American aeronautical industry can paste May, 1938 in its hat up along side of its other major turning-point dates. Both houses of Congress finally have seen their way clear to passage of bills designed to stabilize the foundations and clarify the control of air transport and with it the whole field of civil flying. No matter just what the outcome of joint conference sessions over the two bills' differences, the result should be to remove this country's aviation as far out from under political exploitation as we shall probably live to see it. That all this occurred, to the week, just twenty years after the establishment of our first Air Mail route, is hardly flattering to the speed of our legislative progress—but it does make it easy to remember.

The House Considers

Through the happenstance of the two legislative calendars, the first actual floor debates took place in the House of Representatives on the afternoon of May 9. Almost from the first words of the first speaker, it seemed obvious that the House was in general agreement that some sort of new deal (lower case) was due to aviation in this country. The chief result of this first House session was the defeat of an amendment which would have put control of air transport, not under a separate commission, but under the I.C.C. along with the railroads and the busses. That motion was lost 72 to 46, but the discussion used up most of the time available.

The Senate Approves

Action shifted to the Senate, where most Washington observers expected the most violent fireworks. The Lea Bill in the House had been known to have had much more direct Administration authorship than McCarran's Senate bill. In particular the President's power to remove commission members for any cause whatever, allowed in the Lea bill, was specifically limited to cases of "inefficiency, neglect of duty, or malfeasance in office" in the Senate version. Only a few days before the Senate debate opened May 16, Senator Truman had introduced a substitute bill, similar to McCarran's

REP. CLARENCE F. LEA: His Bill had White House backing

but allowing the wider presidential control. There was some thought that the Senate would actually consider the Truman not the McCarran bill at all. Such was not the case, but as debate opened, the Lea version of the President's power-to-remove was introduced as an amendment. McCarran rumbled through the fight. He had been working for constructive air legislation since 1934. He had fought a long up-hill fight. But if such an amendment was passed he would withdraw his name from the bill and, by inference, his support for its passage. There was wide discussion of other provisions of the bill. Finally it was voted by 34 to 28 to permit the President to remove commissioners at his own discretion. Senator Borah started a long discussion of the bill's effect of strengthening "monopolies". Without voting on the bill itself the Senate adjourned over the week-end.

Would McCarran swing his undoubted well-entrenched support against the legislation? For two days, you may be sure, the group of aeronautical executives in Washington to follow the bill's progress hung on the sharpest of tenterhooks. But Monday cleared up all their fears. McCarran announced he was ready to go along: "I have had more than a score of telephone calls this weekend from air lines and others interested in this legislation," he said. "They said the industry was so in need of some legislation, they asked me to do the best I could." Besides, he indicated, any provision empowering the President to remove appointees at discretion was possibly unconstitutional in any case and he cited a Supreme Court decision to prove it. After a moderate amount of further debate, the Senate passed the bill by a voice vote.

Two days later the House's list of business swung round once again to the Lea bill. With an administration victory in the Senate, the expectation in the press galleries was that the bill would have clear sailing to a quick decision. Contrariwise (as anyone with a good memory of the late lamented reorganization bill might have forecast) the White House-blessed Lea bill got an immediate tossing around. The shooting lasted all day. The Republicans backed a motion to recommit the entire bill with instructions to report it again with regulatory powers lodged in the Interstate Commerce Commission. That was finally overcome by a vote of 213 to 94. Rep. Robert Crosser of Ohio was defeated on an amendment to substitute a provision of the Senate bill setting up a safety board instead of the Lea bill's provision of a single safety director. But the opposition did have its innings over the fight on the President's power to remove commissioners. As a result of their battling the Lea bill, as passed late in the afternoon, contained just the clause in the paragraph dealing with those powers that the Senate had eliminated.

In Conference

As the two bills go to conference between three members of each House, conjecture over what will emerge from their deliberations is attractive, yet rather fruitless. Both bills agree in giving an independent civil aeronautical authority control over air line rates of all kinds; in allowing them, through certificates of convenience and necessity, to plan for the future on an infinitely more stable basis than under any previous set-up. Both accomplish the liberation of aeronautical affairs from their present hodge-podge of control by different agencies. Both make provisions for the absorption by the new commission of most of the Federal employees now engaged in that control. In fundamental intention, then, there is little to choose between the two acts.

Chief differences that must be adjusted are whether the compromise legislation shall provide for five commissioners as in the Senate bill, or for a three-man board with a separate administrator of executive affairs, and another separate safety director, as the House would have it. The Senate equivalent of this last-named safety director is a provision for another five-man safety board to act with, but independently of the commission. There are differences of salary to be debated, the Senate in general being slightly more liberal in its allowance. The Lea bill contains a provision under which the commission is directed to study the airport problem, with specific attention to whether the Federal Government should aid in the maintenance

and establishment of airports. The Senate bill contains a similar provision, but stipulates that while studies can be made the commission should have no power to spend any money on airport improvement or maintenance. Such matters should present few obstacles to intelligent compromise.

More apt to produce real disagreement is the paradox that the administration-sponsored House bill carries the anti-administration limitation on the President's powers of removal, while the Senate bill, less White House-blessed, has specifically removed such limitations. The result may well be that the Senate will go along with the House in this respect—which may raise slight difficulties when the legislation is sent to the President for signature.

Rumors and Counter-Rumors

Long before that event occurs, the rumors and counter-rumors of who will get the commission jobs promise to mount to 120-decibel clamour. Sifting out great bushels of chaff from the few handfuls of wheat, one finds the most consistent rumor has the White House and the old Interdepartmental Committee crowd has agreed to put Col. Johnson, Harllee Branch, and N. B. Haley, of the I.C.C., on the board, with Col. Johnson as administrator (assuming that the commission to emerge from the conferences will be of the House form). All of which may be just so much wishful thinking on the part of the group doing most of the gossiping around Capitol Hill these days.

SPOT LANDINGS
On the Month's News

• The airship cause is dragging like a rain-soaked guide rope. Secretary Ickes just won't give down any helium for the LZ-130. Experts from the Army and Navy testify that airships wouldn't last a day in a European war. Dr. Eckner arrives and is warmly welcomed by Washington officials. Confers with Ickes. The President takes the matter up then passes it back. But Ickes still says he cannot "under the present law" permit the export. And Congress has dredged up enough opinionated mis-information on the subject to be in no mood to change the regulations. . . . Add to that the recent orders for Commander Rosendahl to report for sea duty. That takes America's No. 1 airship champion off the firing line just when he's needed most. . . . The one hopeful bulletin is word that Congress kept provision for a $3,000,000 training rigid in the Big Navy Bill which the President signed last month. But the Navy seems apathetic on the subject and Washington opinion has it the project is still far far off.

• The explorers are getting restless again. Richard Archbold is due to get away in his Consolidated "Guba" anyday now. Take-off: San Diego. Route: Honolulu, Wake. Destination New Guinea, where his expedition will do a lot of work for the American Museum of Natural History. Crew includes: Russel Rogers, pilot; Lewis Yancey, navigator; Gerald Brown, flight engineer; Raymond Booth, radio. . . . Lincoln Ellsworth announces he will return to the Antarctic to explore what is called the Enderby quadrant. He is to leave New York on Aug. 13. He will take sixteen men and, of course, his veteran Northrop. . . . Commander Schlossbach of the McGregor party at Reindeer Point, Greenland made a notable flight over Elsmere Island last month. . . . Dr. Lauge Koch, the Danish explorer, made another between Spitzbergen and North Greenland, finally putting to rest all rumors that a land mass existed in that area.

• 1938 Gold Medalist for "the promotion of international good-will and . . . commercial peace" is Juan Terry Trippe. His work as president of Pan American Airways earned him the American Arbitration Association Award for the current year. Presentation was made at a luncheon tendered jointly by the Association and the New York Foreign Trade Week Committee at New York's Waldorf-Astoria May 24.

• The greatest achievement in aviation for any given year is marked by the award of the 26-year-old Collier Trophy. Last year it went to PAA's Trippe, year before to Douglas's Douglas. Other holders have included Glenn Martin, Elmer Sperry, Glenn Curtiss, Orville Wright. Last month NAA announced new rules and procedure for selection, named an award committee for 1938: James H. Doolittle (chairman), Henry B. DuPont, George W. Lewis, William B. Mayo, Leighton Rogers, Edward P. Warner, T. P. Wright, S. Paul Johnston.

Following an exhaustive survey of apprentice systems here and abroad, the Wright Aeronautical Corporation has adopted a system of mechanics' training involving a four year course in both theory and practice. During the training period the apprentice is full indentured and can neither leave or be discharged except for the gravest offences. At the end of his apprenticeship the candidate receives a certificate plus a sum of money in excess of his regular pay, which averages about one-half the wages received by a skilled machinist over the four year period. Boys between the ages of 18 and 21 are enrolled and are taken, without exception, from the company itself. Each yearly term consists of 2,000 hours, of which 200 hours must be spent at vocational schools.

LONG ISLAND ASSETS: At top, Grumman Aircraft Engineering Corporation's handsome new quarters at Bethpage. The factory has 100,000 sq.ft. of floor space. The field has half-mile runways in all directions. Just above, another air shot shows Kollsman Instrument's bustling new plant at Elmhurst

First Quarter Production Tops 1937 Record by 47 Per Cent

	This Year		Last Year		Value Ratio
	Units	*Value*	*Units*	*Value*	*1938 to 1937*
Military Planes	283	$12,136,285	103	$5,648,736	2.15
Military Plane Spare Parts		2,057,381		1,794,955	1.15
Military Engines	681	4,707,543	496	3,432,933	1.37
Military Engine Spare Parts		1,263,983		945,203	1.34
Total Military		$20,165,192		$11,801,827	1.70
Civil Planes (Single-engined)	317	$675,579	351	$861,992	.78
Civil Planes (Multi-engined)	37	3,335,512	50	3,497,619	.96
Civil Plane Spare Parts		3,084,972		1,509,166	2.04
Civil Engines	718	2,978,487	788	3,015,668	.99
Civil Engine Spares		1,371,708		881,652	1.56
Total Civil		$11,445,258		$9,766,097	1.17
Total Military and Civil		$31,610,450		$21,567,924	1.47

Exports (including chutes and accessories) for the three months' period totaled $14,320,273—99.3 per cent ahead of last year's first quarter figure. Production data by the Aeronautical Chamber of Commerce. Export figures from the Department of Commerce.

Ryan production is hitting new highs. Close on the heels of delivering a fleet of S-Ts to Mexico for military training comes word that Honduras has ordered a fleet of S-Ts for service at Tegucigalpa. These planes will be of stock type powered with the Menasco 150 h.p. supercharged engine, and equipped with dual controls and dual instruments. In addition to the S-Ts Ryan's production line is jammed with the new all-metal cabin S-C.

Since branching out into the field of equipment manufacture, Ryan Company has been forced to expand its facilities for the production of stainless steel manifolds. Latest order reported, for 500 complete collector ring assemblies and over 400 exhaust tail pipes is said to be the largest single contract ever awarded for the manufacture of aircraft exhaust manifolding. Involving an amount of approximately $100,000, the order is for latest-type Army bombers.

To meet a flood of orders for its unique Librascope, the Meredith Instrument Company has expanded its factory facilities, moving into a new plant at Burbank, Calif., with several times the available area of the original small factory in Inglewood. During its first year of manufacture the Librascope has been adopted by 12 airlines and the U. S. Army. Seventy-six Librascopes have been delivered in the past twelve months, production is now at the rate of 15 per month, and 75 are now on order.

The Douglas Aircraft Company still reports top earnings. The first quarter of the current fiscal year, ending last February 28, showed earnings of $406,771, equal to 71 cents per share of capital stock, and earnings for the second period, ending May 31, are expected to be equally as good. Donald Douglas told the annual meeting of stockholders that a dividend was therefor in prospect for the current fiscal year. Sales for the period from December 1st last to April 15th were reported at $10,000,000, with sales for the first quarter totalling $6,650,000. Bank loans have been reduced from $5,230,000, to $3,030,000. No new financing is in prospect. Production is expected to show a slump after May 31st while the company gets under way on its order of B-18 A bombers.

But while earnings went up, Douglas was under fire on two labor fronts. The A.F.L. International Association of Machinists complained to the National Labor Relations Board that the Aircraft Workers Union, Inc., was a company union receiving aid and support from Douglas and the NLRB thereupon ordered the Company to disestablish the A.W.U. Of even greater significance is the recent NLRB order requiring Douglas to reinstate in its employ eleven convicted sit-down strikers. Douglas has directed his attorneys to petition the Ninth United States Circuit Court of Appeals in San Francisco to review and set aside the order.

The Naval Aircraft Factory has just completed its first 100 per cent government-built aircraft—185 training planes, 20 of them mounting 235 hp. NAF-R760 engines built under Wright license. Now in production: 44 scout observation planes copied from the Curtiss SOC; enough parachutes to fill about half the Navy's needs.

The harassed stockholders of Kinner Airplane and Motor Corporation, Ltd., face an assessment of 10 cents per share to raise working capital for conduct of current business. With a par value of $1, Kinner stock is now selling (at the time of writing) at 2¢ per share. There are 1,450,295 shares of stock outstanding. The company is now operating under provisions of the Federal bankruptcy laws, supervised by Federal Judge Hoelzer.

The first five Fairchild "24's" of the 23 contracted for by the Bureau of Air Commerce were delivered in mid-April. Delivery of the entire fleet is scheduled to be finished by June 4.

PROFITS AND LOSSES

» AIR ASSOCIATES, INC., for five months ending Feb. 28, 1938, net profit $45,500, equal, after dividend requirements, to 37¢ per share on 99,884 common shares.

» AVIATION CORPORATION AND SUBSIDIARIES, for three months ending Feb. 28, 1938, net profit $149,438 or 5¢ a share on 2,777,750 shares of capital stock. Compares with net loss of $43,347 for the same period last year. Net sales for the quarter, $2,346,000 against $977,000 for a year ago. Unfilled orders for planes, engines, and propellers, amounted to $3,291,991 on Feb. 28, 1938; $3,800,000 as of Nov. 30, 1937, the close of the company's preceding fiscal year.

» BENDIX AVIATION CORPORATION AND SUBSIDIARIES, for quarter ending March 31, 1938, net loss $561,605, compared with profit last year of $806,508 or 38¢ each on 2,097,663 shares of $5 par capital stock. For twelve months ending March 31, 1938, net profit $887,020 of 42¢ each on 2,097,663 shares.

» BREWSTER AERONAUTICAL CORP., for quarter ending March 31, 1938, net profit $93,362, or approximately 27¢ a capital share. For period from organization of company, Feb. 10, 1937, to Dec. 31, 1937, net profit $19,328, or approximately 6¢ a share.

» CURTISS-WRIGHT CORPORATION, for the first quarter of 1938, net profit of $733,910, the largest for any quarter in the company's history, equal to 63¢ a share on 1,158,464 shares of Class "A" stock. Compares with $269,251 or 23 cents per share for the same period in 1937.

» MACWHYTE COMPANY, for the year ending Dec. 31, 1937, net income $302,826; for 1936, net profit, $267,730.

» PAN AMERICAN AIRWAYS CORPORATION for the year ending December 31, 1937, net profit of $510,416, after depreciation, taxes, etc., equal to 37¢ a share on 1,387,772 shares of $5 par capital stock. Compares with $955,352 or 69¢ a share for 1936. Decrease in earnings attributed to losses from trans-Pacific service inaugurated Oct. 21, 1936, increased cost of labor, fuel, and taxes, and losses occasioned by deductions on a gold basis for mails carried since 1933. Expenditures for new flight equipment and ground facilities aggregated $4,500,000, and $1,200,000 was deposited in escrow under commitments for new aircraft for future delivery.

» RYAN AERONAUTICAL COMPANY AND SUBSIDIARIES, for year ending Dec. 31, 1937, net income $16,370 or 6¢ each on 259,650 capital shares, against $4,223 or 2¢ each on 193,070 shares in 1936.

» SOLAR AIRCRAFT COMPANY, for 48 weeks to April 2, 1938, net income $43,375, or 33¢ each on 129,640 shares. Total sales for the period, $453,471.

» STEARMAN-HAMMOND AIRCRAFT CORP., for year ending Dec. 31, 1937, net loss $145,173, equal to 51¢ a share on 286,800 capital shares.

» TRANSCONTINENTAL & WESTERN AIR, INC., for 3 months ending March 31, 1938, net loss $590,079, compared with net loss of $359,933 for 1937. Increased operating expenses of $308,492 were responsible for increased loss.

» UNITED AIRCRAFT CORPORATION, for quarter ending March 31, 1938, net income of $1,072,298 or 42¢ on 2,531,482 shares of capital stock which will be outstanding when all exchanges of common stock of United Aircraft & Transport Corp. have been effected. For same period last year, net income of $698,852 or 28¢ each on 2,518,722 shares.

» WRIGHT AERONAUTICAL CORPORATION, for quarter ending March 31, 1938, net income of $586,288 or 98¢ a capital share; compared with net income of $286,353 or 48¢ a share for the same period last year.

AVIATION IN WASHINGTON

by BLAINE STUBBLEFIELD

Sideshow Notes as McCarran-Lea crowds big tent

Hearings on United's claim against the government for damages resulting from the cancelation brought skeletons out of closets but the press wasn't interested, much to the surprise of some observers, including this one. Further hearings were set for May 17 because Ex-PMG Walter Brown's railroad developed labor trouble. The banishment clause in the air mail act, said a reminiscer, was a roundabout method of imposing by legislation a sentence which courts would have refused.

Time extensions on certificates and ratings granted by the Bureau of Air Commerce, were to enable BAC to catch up on paper work, and for convenience of pilots, dispatchers, schools, repair stations, whose licenses under old law would have overlapped the new papers too much. Particularly the extension helped Pan American pilots, who are used to ground bearings rather than range navigation.

The Navy's "Information" Frontier, a line of radio stations and bases down the Pacific from Alaska south and east to Panama, enlivens the new international interest in islands. Japan has an information line, too, it seems. There's a patch of no-man's ocean in between. Naval observers see "spheres of influence" spreading over the water. Expect to hear more about those floating docks for radio and basing, they say.

Used airplane trade-in values are being standardized in a guide book by the Aeronautical Chamber of Commerce. The job is nearing completion as this is written. Rapid development of design makes basic trade-in prices even more necessary than in automotive business.

Autogiros are getting a whirl. House Military Affairs is waiting for more statements before reporting Rep. Frank Dorsey's bill authorizing $2,000,000 for experiment with rotor craft. Navy testified it doesn't need giros, but some technicians said it missed a point: giros could land on ships that couldn't take airplanes. Army of course is much interested in giros as sausage balloon substitutes . . . Capt. Boris Sergievsky, vice-president of Debothezat's Helicopter Corporation of America, described plans for a helicopter faster than airplanes to cost $500 apiece in volume. Be that as it may, Breguet, European airplane builder, and some American authorities, are on record that rotary craft are soon to develop in a big way.

Only half enough naval airplanes could be built in war time, Admiral Arthur Cook said recently, according to Senator Walsh, chairman of Naval Affairs committee. Admiral Cook stressed the need for constant orders and close relations with private manufacturers. He said the Naval plant at Philadelphia produces only ten per cent of peace time needs. Except for taxes, the Admiral is reported as saying, private concerns can undercut the government costs 15 to 20 per cent.

Ultra-short-wave radio beams, development of which is suggested by International Telephone and Telegraph, is already under experiment at the Indianapolis station of the Bureau of Air Commerce. High frequency has been used with considerable success on two-course beacons in Europe. But Europe depends mostly on direction finders and contact flying.

An outside mail route to Alaska is the hope of the Post Office. While the U. S. and Canada trying to trim each other in right-of-way horse trades, the PO would like to establish a line to Alaska before the contract system is abolished by legislation. Most engineers agree that an outside route, beyond the three-mile limit, could be flown successfully with multi-motored equipment, but some don't think so. Of course there is the usual speculation whether any other than Pan American will bid. Probably PAA doesn't care much whether it gets in under the PO or the proposed civil aviation commission. The board would adjust its rates anyway.

One year's extension of foreign mail contracts could be made by the PMG under a bill reported by the House PO Committee. Probably no action is contemplated. It merely indicates that even the PO, like the rest of us, was in doubt as to future legislation. It was known all along, of course, that a congressional resolution could prevent contracts being thrown open to bids. Pan American was never as worried as some of the wishful-thinking opposition indicated they should be.

AVIATION PEOPLE

Who's Who in This Month's News

PRIME MOVERS: Orville Wright and Henry Ford meet at the dedication of the Wright home and shop in Greenfield Village, Mich.

ANOTHER: Jacqueline Cochrane gets the trophy posted for best gal's performance in the 1937 Bendix. Presenter is Howard Welsh, V. P. of Bendix Export.

WORM CATCHERS: Six members of the Early Birds set out for the Wright dedication. Left to right—Jack Vilas and Victor Vernon of Chicago; P. G. B. Morriss of Los Angeles; R. G. Fowler of Big Bear, Calif.; Matty Laird of Chicago and Harry Graham of San Francisco.

BIRTHDAY PARTY: Consolidated Aircraft last month went to town in celebration of its fifteenth anniversary. Here are five who (very properly) drew lions' shares of the congratulations. Center — Major Reuben H. Fleet founder, and President. Top left—Charles T. Leigh, Vice President. Lower left—I. M. Laddon, Chief Engineer. Top right—C. A. Van Dusen Vice President and Works Manager. Lower right—E. N. Gott, Vice President.

BIG FOUR: These are the Generals who last month staged the G.H.Q. Maneuvers. Above left—Maj. Gen. Frank M. Andrews, commander of the entire G.H.Q. Air Force. Above right—Brig. Gen. F. L. Martin, 3rd Wing. Lower left—Brig. Gen. Delos C. Emmons, 1st Wing. Lower right—Brig. Gen. A. N. Krogsted, 3rd wing.

HERSELF: Patricia (Pat) O'Maley, eastern journalists' favorite woman-in-business, spent Air Mail Week in Washington. She is American Airlines' New York press agent.

NEPHEW: Anthony Fokker, whose uncle is the Anthony Fokker, sets out for South America aboard a P.A.A. clipper. He is a test engineer for Sikorsky.

AVIATION BOOKS

In Tabloid Review

THE AIRCRAFT YEAR BOOK FOR 1938, *By Howard Mingos;* Aeronautical Chamber of Commerce of America, New York City; 518 pp.; $5.00.

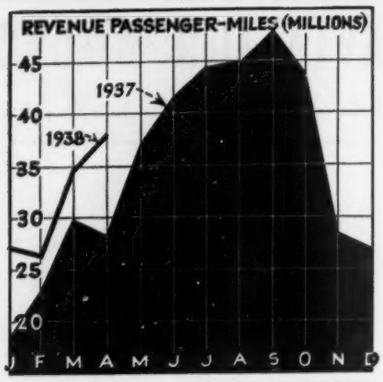
Milepost of aviation development in America is Howard Mingos' annual presentation of facts and figures. With the 1938 edition it rounds out its second decade of continuous publication. Current volume lists over 100 types and models of U. S. aircraft, of which 53 are military, many of the latter being on the available-for-export list. Special emphasis is placed on U. S. position as an exporter in world markets. Pointed up, however, is the need for expanded research facilities in this country if we hope to maintain our position of technical superiority for, following our lead, other countries have embarked on research programs that threaten to outrun our own.

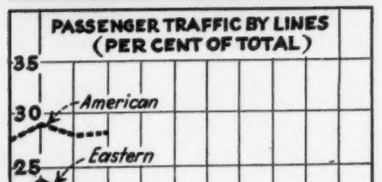
FIGHTING PLANES OF THE WORLD, *edited by Paymr.-Lieut. Com. E. C. Talbot-Booth, R.N.R., compiled by Eric Sargent;* D. Appleton-Century Co., Inc., New York and London; 1938; 608 pp.; $3.00.

An attempt to "out-Jane Jane's" in tabloid form that misses coming within range of its prototype by a wide margin. As a history and a guide to the British Royal Air Force (squadron markings, uniforms, decorations, etc.) it undoubtedly has merit, but as an index to the fighting aircraft of the world it is full of blind spots. As might be expected, British treatment is fairly complete, and U. S. coverage is fair; but the Italian and German information is hopelessly out of date and quite incomplete.

TRANSAER, 1937, *Fischer Von Poturzyn, Dr. Heinz Orlovius, August Dresel; Richard Pflaum Verlag,* Germany; 1938; 520 pp.

Recognizing that air transportation has outrun national boundaries and has become a world-wide phenomenon, the authors have turned out a volume designed to stand as "a monument to the men, who, for the most part quietly and anonymously, have established regular air traffic over countries and oceans." Statistics and photographs of most of the principal scheduled air lines of the world are well presented. There are a few gaps, but they will undoubtedly be filled in in subsequent editions when operators everywhere recognize the importance of the work and contribute more fully.





AIR TRANSPORT INDICATOR

May 1, 1938

139.2

Which is the ratio of the revenue passenger miles reported by the Air Transport Association as carried by all domestic airlines during April 1938, to the corresponding figure for April, 1937.

For the fourth consecutive month the Indicator stands well over 100. First four months totals: 1937—97,211,065; 1938—126,678,260, up 30.0 per cent.

LOGGING THE LINES

Air Transport Drift Sights

by DAN SAYRE

What the lines did as Congress remade their future

Log Entries: Chicago and Southern, which has just restored its "Valley Level schedules to three-a-day, has kept the wives-free plan working right up to June 1. . . . Postal officials say the average train-carried letter travels 469 miles; the average air mail letter travels 1,558 miles. . . . The Airline Feeder System has moved into bankruptcy under Clause 77-B but will continue to operate a single round trip per week on its Newark, Bridgeport, New Haven, Hartford and Springfield route—in hopes of eventual mail income under a new legislative set-up. . . . Pan American has opened "the world's largest airplane hangar" at its Dinner Key base in Miami. The open floor space is 150 x 180; the clear head room 35 ft. . . . Pan American's statement for 1937 showed a profit of $510,446, which would seem a great deal for any other air line. But the year previously P.A.A. earned $955,352. Trippe explained the drop off to losses in the Pacific and to the unfavorable operation of foreign exchange rates—a matter recently adjusted with the P.O. The cost of Atlantic survey operations didn't help much either. Imperial Airways had a better arrangement—it made its flights not for itself but on behalf of the Air Ministry, which footed the bills. . . . TWA reported a net loss for the first 1938 quarter of $590,079, compared with a 1937 figure, also a loss, of $359,933. Gross revenue was up, however, and Frye's accompanying statement reflected optimism over the prospects of business with the Boeing Stratoliners to go into TWA service this fall. . . . TWA has, incidentally, already started recruiting twenty-five stewards who are to help out the hostesses in the cabins of the new ships. It is also selecting flight engineers from its ground shops to serve as third-men in Stratoliner flight crews. . . . United Air Lines has completed a survey of "Who Travels by Air?" Seventy-three per cent of its passengers were found to be between the ages of 30 and 50. Ninety per cent were travelling "primarily for business," although 17 per cent were combining vacations with their business missions. Only three per cent of those surveyed did not continue flying once they had patronized the air lines. . . . United featured Air Mail Week and also publicized the capabilities of their new ships by bringing one schedule into New York direct from Denver. That's farther than the much-touted South Atlantic crossing from Africa to Brazil. . . . The New York air line set-up is beginning to look very elegant indeed. The Big Five—P.A.A., U.A.L., T.W.A., E.A.L., and American—have gotten together on a project to build a swell terminal and office building at 42nd St. and Park Ave. Matters have moved through the verbal approval stage; now simply await signing of formal contracts. Add to that the swift progress being made on the North Beach land-and-sea terminal just across the Tri-borough from Manhattan and it looks like the country's biggest city is at last going to have airline facilities that become it.

Air Mail Week is come and gone. And like a hundred air line press agents slacking around the office for a change, were glad its over. When the preliminary Post Office releases mentioned that the whole post office directory of 46,000 communities would somehow get on board we thought they were maybe stretching things a bit. But from the huge pile of releases and clippings that have flooded your correspondent's desk we'd say they had undershot a little. We had never realized there were so many different air lines with claims to the "oldest" tag; nor so many pilots who took the first mail from here to there; nor so many people who rated credit for getting the air mail started. And our office girl says that if she ever reads another account of that "mail must go through" era of the Washington—New York service, she'll scream.

But it was a marvelous job of publicity promotion. From Mrs. Roosevelt and Shirley Temple down to the last flying grandmother and the last postmaster of a ten-box post office, the non-air line talent enlisted came through like troupers. The papers and the radio stations couldn't have been more helpful if we'd been advertisers in the cigarette-automobile league. States that organized feederline demonstrations—and were still getting bulletins that some remote state arranged so many dozen planes winging around over the sagebrush—started ground swells beyond counting for mail extensions. As

Blaine Stubblefield writes us from Washington, the Post Office is satisfied that every U. S. denizen with sense enough to grease a gimlet now knows what the air mail is, where it runs, how much it costs and how much time it saves. Trouble from here on is to convince newly-air-mail-conscious South Coyote that it doesn't quite yet rate a spot on the air mail map.

What A. M. W. did and will do to mail poundage, no one will presumably know until the P. O. gets out its May figures —along about August. But it will kick the chart up substantially, that's certain. By the time the new Commission —just reported passed through Congress—gets around to finding how much "subsidy" there is in this business there shouldn't be a trace of it left, even in the Post Office books.

It was certainly a relief to find no one bidding nothing-a-decade on the new mail contract routes last month. Here are the results:

Witchita-Pueblo, Continental Airlines bid 33 cents a mile; Braniff Airlines 28.5; J. Ruel Armstrong 23.9.

Detroit-Sault Ste. Marie, R. Stuart Weeks was low bidder at 28.5.

Phoenix-Las Vegas, TWA bid 31 cents a mile; Western Air Express asked 32.32.

Jacksonville-New Orleans, Chicago and Southern asked 30.5; Eastern Air Lines 27 and seven eights; Delta Air Lines 27.4; National Airlines, Inc. 19.5.

Tampa-Memphis, Chicago and Southern bid 33 and one third; Delta Air Lines 23.4; National Airlines 21; Eastern Air Lines 17.

On the proposed route between Bismark and Minot, N. D., there were no bidders.

American Airlines will fight to hold its present traffic lead to judge from all recent bulletins. Bulletin (1) American has concluded an agreement with Airlines Charter Service, an association of some 41 local operators, for the extension of its regular services. Hereafter any American traffic office will arrange off-line charters for any passengers desiring such a service. Rates for three and four-place ships are listed at from 18 to 25 cents per plane mile—about the cost of a New York taxicab. Bulletin (2) American has strengthened its board of directors with the addition of the following names: Amon J. Carter, Fort Worth; Silliman Evans, Nashville; James Bruce, New York; Harry E. Benedict, New York; Chandler Hovey, Boston; David S. Ingalls, Cleveland; Mark T. McKee, Detroit, C. C. Moseley, Los Angeles. Bulletin (3) American has set up another big schedule of all-expense air tours, ranging from a honeymoon trip out of New York to Niagara and return up to elaborate tie-ups with Pan American Airways for circles around the Carribean. Prices for domestic tours range from $68.66 to $525.36.

Our secret service agents have been shipping in enough reports to paper the dug-out we'd have to build if we printed the half of them. Sifting out what's already most-in-the open: American is reported to be definitely interested in the purchase of a half dozen Boeing 307 Stratoliners. Which would leave United holding the bag on the DC-4 since Eastern and Pan American don't look like prospective heavy purchasers and, of course, TWA has already put its money down on the Seattle product. But another rumor has Douglas already holding an order for 16 DC-4's from some European interest—which would let United buy DC-4's at the same large-order price as though its domestic competitors hadn't taken a run-out powder . . . More fragments on the designs submitted for Pan American's 100-passenger dream pigeon, confirm the report Douglas turned in the only landplane—of about 120,000 lb. The three others have submitted boats which gross about 200,000 lb.; are powered with in-line liquid cooled engines. The Sikorsky and Boeing efforts are reported pretty straight scale-ups of past models, with six engines. Consolidateds the most daring, with but four engines.

New Orleans-Houston to Brownsville extension would please Eastern no end and annoy Braniff the same. Harllee Branch is said to be in favor of it. This section was scheduled to be advertised once before, but was withdrawn after printing. Capital aviators think the PO will ride along and pass the hot spud to the proposed civil aeronautics board. American Airline, meanwhile, sits helplessly by with its route quota all used up.

An Air transport "field day" was staged May 1st at Union Air Terminal, Burbank, under local N.A.A. auspices. Approximately 15,000 people were attracted to the field for a showing of transport planes, including the Boeing 247, the Douglas DC2, DC3, DST, the Lockheed 12, Lockheed Electra, and Lockheed 14, and the new Timm bi-engine transport.

A public address system, and a full complement of guides and hostesses made everyone welcome and helped to herd—pardon us, usher the folks through the many planes. Robert Trow was in charge of arrangements. It sounds like a good stunt for other spots around the country.

NOT BIG-APPLING: This is no jitter-bug praising Allah at a fancy dress ball, but American Airline's Passenger Agent Nicholson showing how he talks to pilots—when they're sitting at the controls of a transport and he's outside on the Chicago Airport. Above left: "Turn 'em over". Above right: "Cut Motors". Below left: "Departure will be on schedule". Below right: "Arrival is on the Nose".

Prayer

BIG SHOTS: Carl Florman (left), Managing Director of Sweden's A. B. Aerotransport, puts over a point to Albert Plesman (right), General Manager of the K.L.M.

AS OTHERS FLY IT

A Birdseye-View of Aviation Abroad

England's mission gets Ministry in hot water

A lot of red faces blossomed in England when the decision to send a military mission to the U. S. broke in the news. Super-British C. G. Grey, editor of The Aeroplane, was caught several miles off base. He had just tossed the first rumors into the editorial ashcan as either a dastardly plot to discredit Old England's abilities or an American gag fathered by his old pal Cy Caldwell . . . What the mission is up to still has the English guessing. The first semi-official explanation was that it is in the U. S. to talk real business. The story made pretty good sense—production troubles were bad enough even before the decision to bend the throttle all it would take a few months ago to beat the Germans. Heavy bombers were a particularly tough problem; there wasn't any really hot design even if they could be turned out fast enough. To shop around the U.S. for as many as could be produced in a hurry looked smart, and the first dope in England was that the boys are over here to place definite orders for them. As soon as everyone settled back to digest this Lord Winterton, Under-Secretary for Air, got up in Parliament and said the mission was "concerned solely with exploratory inquiries" and wouldn't sign any orders for anything . . . Part of Lord Winterton's speech hinted at another explanation—that the purpose of the mission was to build a fire under the aircraft labor unions. There have been a lot of small strikes when unskilled workers were brought into the factories under the expansion program. Labor doesn't like the government much anyway, and when it was called on to give its all to save the dear old Empire, came back with charges of profiteering. Making the unions feel they were responsible for sending the mission to the U. S. might make them sorry for letting down the playing fields of Eton and the thin red line of heroes . . . If this was the Government's idea it certainly backfired on them, for the manufacturers took it as a black eye and started writing nasty letters to the Times hanging the whole mess on the Air Ministry. There were stories of some factories being short of work and having to discharge skilled men because of red tape and mixups in scheduling orders, of shadow engine plants making parts for obsolete engines.

The shooting grew so heavy by mid-May, the Government had to throw somebody out of the sleigh to hold off an inquiry into the whole Air Ministry. On the 16th Viscount Swinton resigned as Air Secretary and was succeeded by Sir Kingsley (Cherub) Wood. The next day Lord Weir resigned his post on the Air Council. Captain H. H. Balfour was appointed Parliamentary Under Secretary for Air . . . Sir Kingsley is currently one of the best known figures in British politics. In past terms as Minister of Agriculture, of the Post Office, and of Health the little five-footer stirred things up in great style. If anyone can hold off the Opposition from putting through an investigation into the whole RAF, Wood can. But the shuffle at home leaves the mission in the U. S. and Canada with little to do but hurry back to find out what the score is.

The French have been dithering, too. Along about the time the experts decided what was needed to improve production was a little cash money to spend for airplanes, politics started getting in the way and things coasted along until the government of Premier Daladier came in and stayed long enough to get its coat off anyway. By that time most of the aircraft workers were out on strike against any increase in the legal 40 hour week—probably mostly so nobody would forget their political power. These strikes were the first thing the new government tackled and the unions came out with their ears pretty well beaten back, agreeing to work overtime with a very small increase in hourly rates. The premier next charmed enough money out of French sox to boost planes contracted for to 1,810. Then to give things a proper kick-off he announced that an order had been placed for 100 Curtiss fighters to be delivered in Oct. And he would send the U. S. a mission, too—one presumably ready to talk immediate business.

A little sweetness and light turns up in the middle of the war talk with a cooperative effort under way to find out all there is to know about North Atlantic meteorology. German, Norwegian, British, Danish, and American survey vessels are out investigating the Gulf Stream and what it has to do with the weather. . . . All this data will

JUST FOR FUN: These three Percival Q6 monoplanes have not been commandeered for R.A.F. training. They are simply making a nice picture before the one in the foreground starts on its delivery flight to King Ghazi of Iraq. With two Gypsy-six engines they can do 170-175 cruising.

be worked up by the French meteorological ship "Carimare", which is on a three months tour in the region between Bermuda and the Azores. Besides making radio-meteorograph observations, she will gather data from North Atlantic shipping and prepare forecasts. Air-France Transatlantique sent her out, but her work was planned in cooperation with the U. S., French, British, and German weather bureaus, and Pan American, Lufthansa, and Imperial.

Lockheed 14s are beginning to turn up in strange places almost as much as Douglases. British Airways have bought four for their projected England-West Africa run; survey flights should begin this year . . . K.N.I.L.M. will use them on their Australian extension, and maybe on the Java-Philippine route also. . . . One of those optimistic projected airlines can be taken off the map—the line from England to the British West Indies. During a debate on the Cadman Report a government spokesman said the cost of tying in this scattered part of the Empire was more than the service would be worth.

A high output sleeve valve engine is now in production in England, the Bristol Perseus XII, rated at 905 hp. at 6,500 feet. It is a nine cylinder radial 52 inches in diameter, and the English claim it requires a lot less servicing than conventional engines. One of the gadgets on it is a separate accessory gearbox driven through a flexible shaft. . . . Two of them will go in the D. H. 95, expected out this year. This is the first of the fast medium-size airliners the British hope to startle the world with. It will be an all-metal high wing monoplane with retractable landing gear, and is expected to cruise well over 200 mph. with 18 passengers.

Gliding news on the sporting page may come yet; it's been put on the program for the Olympic Games in Tokyo in 1940. . . . Meanwhile the International Commission for the Study of Motorless Flight met in Berne in May for a week of flying plus technical discussions.

8,000 miles non-stop in formation is being talked in England for three of the "geodetic" Wellesley monoplanes in Long Range Development Flight. The standard single-engined bombers have been fitted with extra tanks, and the English hope to get them off with a gross weight of 18,000 pounds, about 6,000 pounds over their maximum service weight. If they get away with it, the structural weight would be down to about a third of the total. . . . The boys have been practicing up to go somewhere for quite a while, but what with wanting a little more time and the summer weather in the tropics not being so good, no attempt on the Russian record of 6,305 miles will be made until fall. The route will probably be Cairo-Australia.

SCOUTING THE SQUADRONS

Notes and Comment on our Air Defenses

Who is winning the maneuvers? So many reporters asked that question last month it almost drove Major Eacker crazy. For some two weeks, though, he did a great job explaining the G.H.Q.'s Atlantic seaboard shindig to the press. Bulletins that the Blues (our side) were sinking Black "transports" and "carriers" right and left destroying whole squadrons of enemy aircraft seemed to keep everybody happy.

Actually we thought the G.H.Q. had won these particular exercises before the first bombers flew grimly out to sea. Sunday, May 1, the first squadrons started east from March and Hamilton Fields in California. By the afternoon of Wednesday, May 3, there were some 3,000 officers and men with 220-odd planes setting up two-weeks housekeeping at eighteen northeastern airports, only one of them—Mitchel—a regular G.H.Q. base. By the following Tuesday, General Andrews' final inspection flight found teletypes and radios functioning busily. War paint camouflage sloshed over all the combat squadrons. Everybody ready. Healthy—not a plane or man lost.

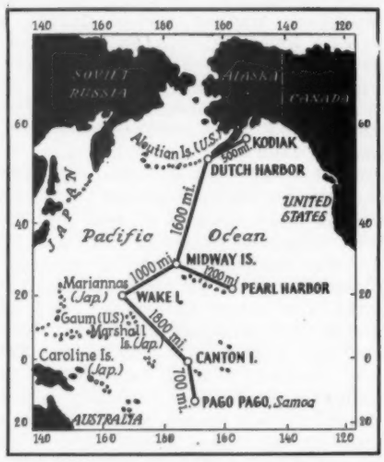
Whether the exercises actually proved an airforce acting with ground troops could repel a formidable attack against our Eastern seaboard without aid from an American fleet is one of those questions.

But there was no side-stepping the proof that the airforce we do have (187 combat planes were assumed to represent some 699) can turn up where and when it's needed and then proceed to carry out a hundred different kinds of missions with the highest degree of efficiency, effectiveness and cooperation with the ground network.

"Basic Research in Dayton, O." is a label you could hang on the airplane itself, on a lot of our structural theory and engine design technique, and on much of our propeller pre-eminence. Now get another such label ready for the pressure-cabin aircraft flight-planned for early arrival. Wright Field is currently on the receiving end of world-wide applause for its completion of a whole year of successful high-level test work in the Lockheed XC-35. Major Greene, who has headed the Army's high altitude work since 1934, says it's just been a triumph of patient horse-sense. But it looks pretty bold and brilliant to the rest of us.

Swellest angle to us is the way the dope has been passed out to the airlines interested in 20,000–25,000 ft. transports. In fact, Wright Field has put out (through the Institute of the Aeronautical Sciences and even the Royal Aeronautical Society) lessons in making cabins air-tight, lessons in the performance of blowers and regulating valves, lessons in fighting the severe problem of frosted windows.

Fragmentations—The Navy's new blimp, the L-1, has been delivered to Lakehurst from the Goodyear factory, Akron. It has 123,000 Cubic feet capacity; is powered with two 145 hp.



THE NAVY PLANS — someday to set its patrol planes patrolling along this mid-Pacific frontier. A joint Army-Navy expedition has already started for Midway to begin work on $2,000,000 worth of improvements that will make it a complete naval air base. Wake will get similar treatment. A $5,000,000,000 base is planned for Kodiac; a smaller station at Dutch Harbor. Canton's future still awaits the end of negotiations between the U. S. and Britain regarding ownership, but at least joint-occupancy seems assured.

Warners. A sister ship is due soon. . . . Lieut. Col. Robert Olds has received the Distinguished Flying Cross—for leading the B-17 squadron to Argentina, of course. . . . The first parcel has been acquired for the 342-acre, $1,500,000 enlargement of Mitchel Field. Condemnation proceedings may take a year. . . . The new 19,900 ton carrier "Enterprise" has been formally commissioned at Hampton Roads. Capt. Newton H. White will command. . . . Patterson Field, Fairfield, Ohio, is in full operations turning out autogiro pilots and mechanics for the air Corps. . . . The first Distinguished Flying Cross awarded to a Coast Guardsman has gone to Lieut. C. B. Olson for bringing in a seriously-ill army officer from the transport "Republic," 300 miles at sea, June, 1935.

AVIATION'S OPERATORS CORNER

Tagging the Bases with

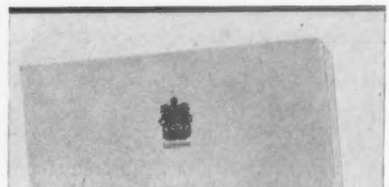
LES NEWLLE

Compulsory insurance laws for airplane owners are brewing in a number of states right now and sooner or later aviation people will have to do something about them as they may easily constitute another serious threat to private flying. As far as we can see no one but the politician wants such legislation. Insurance companies are opposed for a number of reasons. They have found by experience with automobiles that compulsory insurance increases rates, boosts number of accidents, and spreads litigation, fraudulent claims, and contempt of law, and fosters irresponsibility on the part of drivers. Such laws deprive insurance companies of the privilege of cancelling risks and many notoriously bad examples are permitted the protection of full insurance. The rates now in effect are necessarily high because of the limited spread and any increase in rate would force a great many people to give up insurance. Compulsory insurance would cause them to give up flying. It therefore behooves all of us to make every effort to keep such legislation off the statute books of our own states.

Steadham Acker, widely known dispenser of Southern hospitality, is running another annual air carnival which promises to be bigger and better than any of its seven predecessors and that is saying plenty. Unless you have attended one of these you haven't yet experienced real entertainment. The Birmingham (Ala.) Aero Club is sponsoring the event and Gulf Refining Company is offering free gas and oil to all light planes within a 300-mile radius of Birmingham. A unique feature of Steadham's air carnivals is that admission is free.

Publicist Harry Bruno spiked the rumors that have been running rife in New Jersey newspapers about the cessation of construction work on the new factory at Bendix Airport. His explanation is simple. A complete change in the building plan has been made and the construction has been stopped to give architects a chance to alter the plan. Resumption is expected shortly.

If you have struggled through the long and painful passages of C.A.R. you will appreciate the way our Canadian friends dish up their regulations. A neat little 5"x8" pamphlet, only 50 short pages in length, tells you all you need to know about Canadian Air Regulations. Reading time, from cover to cover, about half an hour. There is a striking similarity in form between the Canadian book of regulations and our Pilot Rules Governing the Inland Waterways of the United States, two copies of which must be carried on every power boat in the country. It might be well for our friends in the Bureau to borrow a copy of the "Pilot Rules" from the Department of Marine Inspection and Registration and boil down C.A.R. in like fashion.



Regulation in the Canadian manner.

Tennessee's new director, Major Walter Williams, is making good use of the one-half of the state gasoline tax earmarked for the promotion of aviation. He has bought five Cubs and 2700 textbooks for five free ground and flying schools he is establishing in key cities of the state. Out of each of the five groups, the 15 best qualified graduates of the ground course will be chosen and assigned an airplane and instructor for flight training. Object is to create 75 private pilots and about 2500 prospects for flying time from local operators.

Operator's Committee Named

California aircraft operators speed association plans.

RAPIDLY CRYSTALLIZING PLANS for a permanent aircraft operators and pilots' association, as voted at a recent general meeting in Los Angeles, twenty-one representative Southern California pilots and operators who had been elected to the executive committee at the general meeting, met April 19 and drafted detailed plans for establishment of a Pacific Coast association, with the intention of later affiliating with a national operators' association. The

California operators' committee. Left to right: Joe Lewis, K. C. Hawkins, Bert Rhine, E. A. Dycer, and Harvey Martin.

operators elected a small working committee to draft detailed plans and present them at a general meeting in the near future. The committee elected consisted of Kenneth C. Hawkins, president, and Judge B. Rey Schauer, Bertrand Rhine, Harvey Martin, Joe Lewis and Edward Dycer. This committee was instructed to immediately institute a membership campaign as a preliminary to the calling of a general meeting to approve by-laws, dues, etc., but extension of the association to cover the entire State of California, and thereafter the group of Pacific Coast states consisting of California, Arizona, Nevada, Oregon and Washington, was favored. All pilots and operators desiring to affiliate with the organization are urged to write at once to Kenneth C. Hawkins, Los Angeles Municipal Airport. It is tentatively planned to set dues at $1 per year for pilots and $5 per year for commercial operators.

Thirty-five airplanes stored at Wings Field (Ambler, Pa.) have made this new hangar necessary. It is 150 ft. long, 50 ft. deep, has 15 ft. clearance and two 60 ft. doors. It is designed to match the other attractive buildings at the field. Above: George H. Miller, who operates the airport.

Mileage Costs Low

Salesmen should compare figures with those of automobiles

THE SIMILARITY IN OPERATING COST PER MILE between automobiles and private airplanes is excellent ammunition for use in sales work. Because of the practice of computing flying costs on an hourly basis it is easy to lose sight of the mileage costs and there is a big opportunity for manufacturers and salesmen alike to educate the public on this point. A very enlightening study of these cost figures is included in a recent S.A.E. paper presented by Luis de Florez, consulting engineer, private flyer of long experience, and one who has given much serious thought to the subject. One of the tables from Mr. de Florez's paper is presented herewith.

In comparing the cost of purchasing and operating airplane, automobiles and motor boats the author points out that the fixed charges on all three types of transportation amount to approximately one-half of the total operating cost. But the airplane, being produced in small quantities, is comparatively expensive. It follows, therefore, that reduced airplane costs, which will come with greater production, will result in savings in air travel costs as compared with other forms of transportation, giving the airplane of the future a considerable economic advantake over surface vehicles.

But all of this airplane operating economy is of no avail if private fliers have nowhere to go accordingly Mr. de Florez stresses the need for the development of ground facilities as an extension of our general transportation system. Small fields, not expensive airport projects, should be provided in every community particularly in rural or vacation districts and landing and fueling stations along the waterways should be more generally available for seaplanes. Such landing fields would be beneficial not only for civil but for military use.

In concluding Mr. de Florez says, in part, "The development of private flying is of immense importance to the nation; first, because it will establish a new class of private transportation, and second, because it will form a large group of individuals with air experience from which to draw aviation personnel for national defense. Those who think that the commercial airlines will provide a reserve of pilot material to be called on in the event of war are deluding themselves. Our present airmail, passenger and express services would be even more vital to the country in such an emergency than they now are. Airplane pilots could not be spared for military service. Experienced men for a rapidly expanding air force would have to be drawn from other sources; private flying offers a selected personnel of favorable quality —selected as to experience, adaptability, and the innate urge to fly.

"The utilization of privately trained pilots as material for military purposes is subject to much controversy, as it is often held preferable to train military pilots from the beginning. Grant that this may be true, when time permits, it seems hardly probable that a sufficient number of pilots for war requirements will ever be trained in peace time. The advisability of utilizing pilots, who have already acquired air experience in civil life, deserves the most serious consideration; particularly since we know that European nations have found it expedient to build up their potential air reserve by fostering the development of the private pilot class by a subsidy and the supervision of flying schools."

LUIS DE FLOREZ who practices and preaches private flying

Approximate Cost of Airplanes and Airplane Operation

			Cost of Operation					
			450 hrs. flying per year			150 hrs. flying per year		
Class	Capacity	Miles-hr.	per hour	per mile	Per pagr. mile	per hour	per mile	Per pagr. mile
$1500..	2	70	$3	$0.04	$0.021	$8	$0.11	$0.055
3500..	2	100	6	0.06	0.030	13	0.13	0.065
6000..	3	120	9	0.075	0.025	17	0.14	0.047
10000..	5	150	12	0.08	0.016	23	0.15	0.030

Question 30:

Do you feel that fixed base operators need an organization to protect their interests and present their views to legislators? If so, who should be included in such an organization? How should it be supported? How should it be organized?

Organization in the Southwest

ALL DISCUSSIONS regarding the proposed Fixed Base Operators organization in this section have been carried on verbally. The accomplishments of the Southwestern Aviation Conference held in Oklahoma City, March 11th and 12th are indicative of the sentiment among private fliers, fixed base operators and other aviation personnel in this section. At a joint group meeting of private fliers, fixed base operators and aviation schools, resolutions were passed indicating the sentiment in favor of a national organization for the protection of the rights of this group.

It seems to be the consensus of opinion of those most interested in the subject in this part of the country that the desired results can be accomplished best by sectional or state group organization banding together all the personnel affected, and having their affiliation with some existing national organization now having an office in Washington that could be used as a clearing house. HAL P. HENNING, *Booth-Henning, Inc., Love Field, Dallas, Tex.*

From an Airport Association

IN A RECENT MEETING of The Cleveland Airport Independent Operators Association, among the many questions discussed was that of the formation of a national organization which would include fixed base operators, manufacturers, pilots, and others interested in the promotion of aviation.

After discussing the pros and cons of such an organization it was unanimously decided by all members that a permanent self-sustaining national organization should be formed and they agreed to put forth a sincere effort toward its formation.

We all have our difficulties in this aviation industry, whether it be the fixed base operator, the private flier or the manufacturer, and unless something is done in the very near future whereby the above mentioned persons assert themselves through the formation of some types of an organization, it is but a matter of time when the aviation industry will have reached such a low ebb that flying will practically cease with the possible exception of the air lines and the various Government units.

Please be assured that you have the heartiest cooperation of every operator on this airport singly, we are sure, and as a group through The Cleveland Airport Independent Operators Association.—J. W. BORTON, *President*, A. E. KANGES, *Secretary*. The Cleveland Airport Independent Operator Association.

QUESTION 31: On what basis do operators calculate their insurance when insuring themselves? At what rate? Has partial coverage, with an insurance company, proved satisfactory and worthwhile? Is there any full coverage policy on the market which is not prohibitive? Hangtown Hawks, Placerville, Cal.

Doubled floor space (16,963 sq. ft.) is provided in Hugh Robbins' new home, at Cleveland Municipal.

President W. T. Piper (left) appoints W. B. St. John, sales manager (center) and Ted Weld, vice-president in charge of sales (right) of Piper Aircraft Co.

REPORT CARD

Of Air School Developments

Major C. C. Moseley has announced the appointment of Walter C. Clayton as chief of structures for the Curtiss-Wright Technical Institute of Aeronautics. Clayton was formerly chief engineer for Pitcairn Aircraft Co., and for Noorduyn Aircraft, Ltd., of Canada; and more recently has been associated with the Aeronautical Chamber of Commerce as engineering executive. Clayton will have charge of all structural engineering at the Curtiss-Wright school.

Jim Guthrie out at Roosevelt Field has just turned out a catalog that sets a high standard in aviation school literature. It tells the story of Roosevelt School in 48 pages of heavy coated paper with attractive illustration and excellent layout. Convincing testimonials and complete detailed descriptions of the courses are featured.

Summer vacation training for students of high schools and colleges is being offered by the Ryan School of Aeronautics. Three months is the average training period for summer vacation students with most men enrolling for Private Pilot's courses supplemented by full day mechanical instruction.

U. A. L. Scholarship winners announced by the Boeing School of Aeronautics are Robert R. Dansfield, Frank M. Crosby, William B. Palmer, and Harry W. Brown. Enrollment for winners starts Sept. 26, 1938, and the winner who shows the best aptitude in flying and ground work upon completion of the first quarter will be selected to complete the Airline Pilot flying instruction of 285 hours valued at $4,600. Each of the four awards consists of the choice of one major course for which the candidate was eligible plus the Solo Pilot Course which includes 20 hours of dual and solo flight instruction.

Gliding

(*Continued from page 31*)

the curve (B) is not as highly placed as it should be. However, even though the glide angles employed may not differ materially, the corresponding values of C_L will be different, and for this reason the glide or air speed "V_g" is much less with flaps down. See Fig. 4.

The Gliding (or Air) Speed "V_g"

An important aspect of the landing problem is that of the gliding or air speed, for it is the excess of kinetic energy at the time of leveling off that primarily governs the length S_3 of the float. Only a cursary glance at Fig. 4 clearly indicates the advantage in using wing flaps for the purpose of lowering the air speed, and hence the kinetic energy, of the ship at the termination of the glide. Gliding with flaps and landing gear down and with Θ at its minimum value provides an air speed about 24 per cent less than that which obtains with the flaps neutral and the gear up. But since the kinetic energy is proportional to the square of the flight speed, this means a difference of over 40 per cent in kinetic energy of glide.

From the force diagram of Fig. 1, we find that $L=W \cos \Theta$ for steady flight, and since $L=\frac{1}{2}\lambda C_L S V_g 2$, the air speed along the flight path will be given by:

$$V_g=(2W/S)\tfrac{1}{2} (\cos \Theta/\lambda C_L)\tfrac{1}{2} \quad (2)$$

where W/S is the wing loading in pounds per square foot of wing area, and λ is the mass density of the air. In so far as landing operations are concerned, the mass density will have a magnitude proper to the altitude at which an airport is located. The curve of Fig. 4 is based on this relation, with values of C_L and Θ taken from flight tests, it being observed that C_L and Θ are functionally related as shown in formula 1.

Increased wing loading will shift the curve higher on the diagram, while decreases due to reduction in fuel or passenger loads will locate the curve lower down on the diagram; but in neither case materially affect its shape. Gliding speeds at low altitudes will be less than those at higher altitudes. For example, with everything else the same, the gliding speed at 10,000 ft. altitude will be 16 per cent greater than at sea level. In any case the gliding speed "V_g" should be sufficiently in excess of the stalling speed, say 15 to 20 per cent, to allow for the leveling off operation which occurs at about the stall angle.

It is well to note the rather rapid decrease in the air speed for changes in the life coefficient for values of C_L under about 0.8. Glides at high angles of attack, with flaps down, will possess values of "V_g" considerably under those at low angles with flaps in neutral.

The variation of the sinking speed "V_h" with coefficient C_L is represented by the curves of Fig. 5. The effect of flaps and landing gear on the relative placement of the two curves is similar to that observed in Fig. 3. With wing flaps down the minimum sinking speeds are not materially different, but like values occur at widely separated angles of attack. For angles of attack below $C_L=1$, the down-flaps position may bring about sinking speeds in excess of those with the wing-flaps neutral. Under such circumstances the shock-absorbing gear would be subjected to a severe treatment if the pilot found it difficult to flatten out his glide into the customary float; the landing would be rough. For higher angles of attack the situation is reversed, and flaps make possible not only low air speeds, but also low sinking speeds. Any likelihood of "squash" landings make low sinking speeds desirable, but it is quite possible to create such a landing by gliding in at an angle of attack too close to the stall. It is instructive to note that for both flap positions, the angle of attack can be varied through quite a range without greatly changing the magnitude of sinking speed.

The "Air Run" Distance "S_1"

The magnitude of the horizontal component "S_1" of the free glide path roughly depends on the boundary obstruction height "h" and the glide angle Θ, as related in the formula:

$$S_1=h/\tan \Theta=h\ C_L/C_D \quad (3)$$

The curves of Fig. 6 have been drawn up with the assistance of the above relation, and show how the air run "S_1" varies with C_L for flaps and landing gear up and down. For both conditions there is one angle of attack at which the air run has its greatest value, being greater in the former than in the latter case. For normal glide altitudes with angles of attack somewhat under the stall angle, the air run with flaps down will be at least 30 per cent less than with flaps neutral. It is instructive to observe the rather flat shape possessed by curve (B), showing that the angle of attack can be varied through a considerable range without materially affecting the magnitude of the air run.

G-100 Wright Cyclones

(*Continued from page 35*)

matic valve gear lubrication featured in Wright engines. An oval nose drain provides improved scavenging.

The cast aluminum alloy mounting section, with strengthening mounting lugs for the more powerful engine, forms the front wall of the supercharger diffuser, and carries the tangential parts for the induction pipes leading to the cylinders.

The supercharger section, also of cast aluminum alloy, carries the vaned supercharger rear diffuser plate, the carburetor, the mounting pads for tachometer and fuel pump, right and left hand gun synchronizers, and the Cuno oil filter. It forms the housing for the accessory drive gears, the bearings of which are carried in an improved design of the cast magnesium accessory section. Raised starter and generator mounting pads both contain spherical oil seals at the drive outlets. Provision can be made for either a 3-jaw or a 12-jaw starter. A spur gear accessory drive is standard.

The dual ignition system consists of two Scintilla magnetos operating two independent sets of spark plugs. These magnetos are provided with blast tube inlets allowing improved direct cooling of the interior of the housings. The entire ignition system is shielded to prevent radio interference.

The conventional crankshaft, constructed of two chrome-nickel steel forgings with one bronze and one steel counterweight, incorporates in the steel weight the Wright Dynamic Damper, which eliminates torsional vibration.

Other features of the G-100 Cyclone are:-nitrided Cylinder barrels, which are three times as hard as ordinary heat treated barrels; improved drives for the constant speed propeller governor, and for the vacuum pumps which are used on modern aircraft to operate retractable landing gear, the Sperry Gyropilot, and navigational instruments; and further development of the 11-inch supercharger impeller.

In addition to powering the new fleet of K.L.M. Douglas transports, the G-100 Cyclones will equip the new four-engined Boeing landplanes now being built at Seattle for Transcontinental & Western Air and Pan American Airways System.

Trans-Canada Rubs the Lamp

(*Continued from page 23*)

ism for the Trans-Canada officials to put through such a Yankee-flavoured program and let us not forget it.

Our wonder tale is only half told, too. Put yourself in the place of one of our countrymen-technical advisers or their Canadian co-workers. Remember that for years you have been spending about half your energies fighting day to day technical problems and using up the other half worrying what the government or some competing airline or your own financial backers are going to spring on you next. Here was a chance to be wholeheartedly concerned with nothing but organizing as perfect an air line as is humanly possible. The Act in its provision of a "preliminary period" had even removed that great curse of all air line history—the pressure for spectacular speed, not of flight but of airline building. The feeling must be that some genii has presented you with a magic lamp. Rub on it and get your air line, but choose wisely.

The Airway

Ten years of preliminary airport building along the route has of course proved a god-send. Not all 92 of the originally projected fields were made perfect, but there are more than enough to give the route plentiful intermediate emergency fields between any of the eleven cities designated as stops on the Vancouver-Moncton layout. (Save perhaps where the projected route cuts across the top of our own state of Maine). And most of the cities along the route already have fields ample for modern equipment. By good fortune and the comparative openness of the Canadian landscape most of the city airports have also been located in regions where building obstructions are few and where zoning regulations against obstruction-building have already been passed or are practical in the near future. Some cities, Montreal is an example, are in process of extending runways, increasing area, improving boundary and floodlights, etc. Toronto is going ahead to develop two terminals, one immediately in town, another in the suburbs where lack of obstacles will make approaches more practical in indifferent weather.

The terrain along the airway itself is—contrary to popular American conceptions—probably superior to any trans-continental route in the States. There is hardly a hill over 2,000 ft. east of Saskatchewan. The Rockies west of Lethbridge are narrower and —at the point of crossing—as low or lower than on at least three of the four American transcontinentals. There is not a scheduled stop on the route over 4,000 ft. in elevation. Snow will of course be a long-winter problem, but a careful study has been made of Northwest Airlines roller technique and general feeling is it will prove more than adequate.

As for radio beams and lights, the Ministry of Transport seems to have uppermost in mind that the Trans-Canada route is for all intents and purposes an inseparable part of a North American airway network. There are already three air line links between the U. S. and the new Canadian system—at Montreal, at Winnipeg and at Vancouver. More are in prospect. American transports cross Ontario between Buffalo and Detroit. Fulfillment of Trans-Canadian plans calls for crossing Maine. Links between the U. S. and Alaska across Canada are under discussion. As a result Canada is equipping its airlines so that American pilots will feel as at-home north of the border as south of it. Radio beacons are to go in at approximate 100 mile intervals along the whole coast-to-coast route. About half are already in place. Built by the Radio Receptor Company of New York they will be similar to the latest installations being installed by our B. A. C. Each station will have four steel towers 145 ft. high. Each transmitter will have optional 150 or 400 watts output. Each will be fitted for simultaneous voice and range transmission. Specifications in Canada for light beacons have been identical with American practice for almost a decade.

Flying Equipment

Trans-Canada's selection of Lockheed transports rather than larger equipment follows logically from an analysis of the route's traffic potentialities. Good mail loads are certain almost from the start. As we have pointed out, there is already a substantial start for a Canadian air mail habit built around use of American routes. Express is also hopeful—last year Canada's commercial planes carried more than 30,000,000 pounds of freight. While most of this was, of course, in regions where no rail facilities existed, there are good indications that substantial shipments will turn up for Trans-Canadian forwarding. Passenger volumes are more problematical. But more passengers are certain to buy tickets between the large Eastern cities than will go for the full trans-continental trip. The summation of all these factors spells ships with ample cargo space and capacity rather than big passenger quotas. Much as Northwest airlines solves a similar passenger traffic spread, smaller planes will lend themselves to increases of frequency along sections of the route where traffic warrants.

In any case by last December Trans-Canada had received three new Electras from Lockheed, taken over two more from Canadian Airways and had also purchased a Stearman mail-plane stand-by from the latter company. Last month two Lockheed 14's were due from the factory, two more were in immediate prospect, a total of ten 14's were scheduled for delivery this season.

Do you remember the compass-tachometer-air speed and two thermometer instrument boards of the planes we started our air lines with? Trans-Canada's 14's will have every facility yet devised by man in them to make transport flying more efficient, reliable and safe. There will be a square yard of Pioneer, Kollsman and Sperry instruments on the panels. There will be Bendix radios and loop antennas. There will be giro-pilots. The big Pratt and Whitney Hornets will swing constant speed props. Flaps and flares and full de-icers. Every last-word airline sinew, right down to the latest model B-G spark plugs.

Maintenance and operations are likewise to start equipped to the teeth with the end-products of twenty years of transport refinement. Most cities selected for stops were already equipped with satisfactory hangars. Winnipeg, which will be the System Overhaul Base, and the town of Lethbridge required new buildings. Accompanying illustrations show the architects elevation and Oliver West's shop layout plan for the Winnipeg project. Both buildings are by the Austin Company (of Canada). Both are designed to permit future expansion at a minimum of cost. Ground radio will be of the new Western Electric 10-channel type 14c, furnished through Northern Electric.

(*Turn to page 68*)

Satisfy yourself that the new Reliant gets off easily and quickly under the most difficult conditions . . . Take-off in a stiff cross wind . . . Take-off with flaps down . . . Take-off with hands removed from the controls . . . Take-off in hot, still air.

Check the Reliant in flight. Compare its smooth ride on a rough day with any other plane of its type. Find out that it is stable under all conditions. Compare the comfort of its seats; its quietness; its ventilation; its vision; the quality and tailored styling of its upholstery; the accessibility of the instruments and controls and its large baggage capacity.

See how the Reliant simplifies landings . . . How it makes landings safer . . . Get the tremendous feeling of safety and confidence that comes with the knowledge that you can stop with a landing roll of only 250 feet . . . Prove that you can land safely in a hard cross wind . . . That the new Reliant's big shock absorbers will smooth out drop landings . . . That you can clear obstructions by a wide margin and land comfortably within the limits of small airports . . . That you can point the nose down sharply to lose altitude without picking up great forward speed . . . That there are no ground looping tendencies . . . That powerful hydraulic brakes can be used both severely and safely.

On the basis that we believe the new Reliant is superior in these fundamental characteristics, we make our bid for your patronage.

Write for your free copy of Stinson Plane Talk, an 8 page pictorial presentation of the New Stinson Reliant.

STINSON AIRCRAFT CORPORATION, WAYNE (Detroit Suburb) MICHIGAN
Division of the Aviation Manufacturing Corporation

DEPENDABILITY
IS PARAMOUNT
with Consolidated Aircraft Corp.
Mountings for the 1000 H. P. Twin Motors of Consolidated's New "PBY" type flying boat. These sturdy mountings are made of "Ohio Special Quality Non-Oxidized" Chrome Molybdenum Seamless Tubing.
"Ohio Special Quality, Non-Oxidized" Seamless aircraft tubing is standard in round and streamline sections as well as other special shapes.
IN aircraft construction where safety comes first, Consolidated Aircraft Corp., with many other leading manufacturers, has full confidence in "Ohio Special Quality Non-Oxidized" Seamless Tubing for tubular fuselage construction or motor mountings.
It was "Ohio" who led the way to the present established Army and Navy standards of Chrome Molybdenum 4130-x tubing.
Then followed the "Ohio" process of controlled atmosphere annealing and normalizing that gives additional factors of safety in aircraft construction.
FOR SAFETY'S SAKE STANDARDIZE ON "OHIO SPECIAL QUALITY NON-OXIDIZED" SEAMLESS TUBING
The OHIO SEAMLESS TUBE CO.
OHIO SPECIAL QUALITY
Shelby, OHIO

Trans-Canada

(*Continued from page 66*)

It would seem, somehow, almost unfair to let a raw air line set up in business with such a beautiful layout —if it weren't that Trans-Canada showed from the first that it appreciated that it must match its equipment with personnel of equal quality.

Personnel Training

As we have said earlier, the Canadian woods are full of experienced flying men. Men with thousands of hours of the toughest sort of contact flights in their log books. But few of them had extensive multi-motored or high performance experience. Nor had any of them had the opportunity to use modern instruments and radio in actual all-weather day-and-night air line operations.

Trans-Canada's flying operations to date have therefore been more or less full-scale training exercises. By the end of last February, the line's flying roster listed 27 men. A few names have since been added. The big majority have by this time passed through an elaborate schedule of qualifications.

They have been dosed with a complete introduction to their new equipment and its mechanical functions. They have been checked out at Winnipeg or on the Seattle-Vancouver run in instrument flying and night operations. They have worked up through Link Trainer exercises to hooded "low-ceiling" approaches at all their western fields. Starting last December cross-country flights were initiated between Vancouver and Lethbridge, across the Rockies. By February the ground forces were also sufficiently advanced to simulate actual transport operations for each flight. The Ministry of Transport had 24-hour weather service set up at main terminals, and 16-hour shifts at numerous other points. Departures were checked out by despatchers. Flights followed flight-plans. Maintenance crews went through each item of servicing and inspection that will be expected of them after full operations are started.

Finally on March 1, the company was ready to institute experimental air mail flights between Winnipeg and Vancouver. For several months such a service has been continued with about thirty or forty per cent of schedules completed.

Probably every one in the Americas

(*Turn to page 70*)

Symbol of Skyway Safety

AMERICAN AIRLINES received recently Aviation Magazine's Maintenance Award. Well merited is this recognition of a system which has developed a rigid routine of daily inspection, reports and records for all operating equipment. When it is realized that this fleet consists of 48 ships, flying 50,000 miles daily, on routes extending from Boston to Los Angeles, the monumental task of maintenance is apparent. In this well organized safety schedule, engine conditioning is of the foremost importance.

And it is here that "dag" colloidal graphite plays its part. During set-up and assembly, this supplementary lubricant is applied to all friction parts where its inherent ability to lubricate, while, at the same time, withstanding high temperatures and heavy pressures, gives added protection against wear. The Acheson Colloids Corporation is happy to contribute to the maintenance of equipment which is building an envious record of safety for its passengers and crews. Send for detailed technical information.

ACHESON COLLOIDS CORPORATION • PORT HURON, MICHIGAN

dag
REG. U.S. PAT. OFF.
COLLOIDAL PRODUCTS

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Air Commerce Bureau Fairchild 24's

Aeromarine Dependable Instruments were selected for the twenty-three Fairchild 24's recently purchased by the Bureau of Air Commerce, the largest order placed by the Bureau with a single manufacturer.

Designed for field use by Bureau inspectors these ships will fly under rigorous service conditions imposed by varying climates and altitudes from below sea level to 10,000 feet.

Like the Fairchild 24's, the Aeromarine instruments—compasses, air speed and rate of climb indicators, oil temperature and oil pressure gauges—meet the exacting requirements of the Bureau of Air Commerce.

Write for descriptive and installation data.

ALTIMETERS	TEMPERATURE GAUGES
TACHOMETERS	OIL PRESSURE GAUGES
AIR SPEED INDICATORS	FUEL PRESSURE GAUGES
RATE OF CLIMB IND.	MANIFOLD PRESSURE GAUGES
ICE WARNING IND.	SUCTION GAUGES
ENGINE GAUGE UNITS	CLOCKS

All Instruments are available in metric calibration

DEPENDABILITY

AEROMARINE INSTRUMENT CO., INC.
458 Whitlock Avenue Bronx New York

Trans-Canada

(Continued from page 68)

air transport industry has some vivid nightmarish memory of starting up a new route or a new service or even some new much-ballyhooed flight schedule—brass hats, everyone tense, newspaper guys in everyone's hair, dispatchers straining every consideration to get things off on time—to make a good impression. Trans-Canada doesn't do things that way. Typical is the following account, from the *Canadian National Magazine*, of the start of the experimental mail service.

"Bad weather held up the flights for several days. On March 6, one of the planes landed at Stevenson Field, Winnipeg, seven hours and 15 minutes out of Vancouver.

"Of course the weather was ideal or the pilots would not have flown the route," Mr. Colyer said in answer to a newspaperman's question. "They are new pilots on a new job and this is just part of the training. We will take no unnecessary chances. The time was not unusually fast, about what we would expect at this stage of development."

The Future

There's plenty left to be done of course. It will be a year any way before all the fields will have taken on their finished dimensions and aspects. There is still much to do on lighting and radio-beaming of the eastern half of the air way. There are problems to be worked out with the U. S. Government over permission to cross Maine and over new cross border links. There will be schedules to be drawn up and adjusted as traffic shows its characteristics.

Matters of air line regulations, inspection and rates are still "considerations still in hand." But with the government so closely associated with every phase of the new Company, there are no difficulties to be forseen on that score.

The advisers are still at work on operations and maintenance manuals. The Canadian National offices have taken over such problems as accounting, advertising, publicity, legal, medical, purchasing and financial problems. Later the rail company's ticket offices will be sales points for Trans-Canadian passage, though possibly there will also be some separate traffic offices set up. And, oh yes, there will be hostesses to be selected, trained and married off. This is an All-Canada project!

BOEING CLIPPER · · · 314

Largest airplane ever built for service on any of the world's airways is the new 74-passenger BOEING Model 314 flying boat. This luxury liner of the air is designed to span either the Atlantic or the Pacific with mail, cargo, and a sizable list of passengers aboard. · The first of the new 41-ton BOEINGS has now reached the testing stage, preliminary to introduction on the world-acclaimed Pan American Airways System.

Boeing has always built tomorrow's airplanes today!

BOEING

MEN *"in the know"*

KNOW *Roebling Control Cord*

REAL PROOF of the toughness and stamina of Roebling Aircraft Cord can be found in the maintenance department records of the nation's air lines. Here, the choice of a control cord is an important factor in keeping down replacement delays ... in providing utmost passenger safety.

Thus, it is especially significant that on the majority of the country's transport planes, controls are rigged with Roebling.

Roebling Wire Aircraft Products are made in Stainless Steel and High Carbon (Tinned or Galvanized) Steel. They include: Aircraft Wire; Aircraft Strand; Aircraft Cord (6 x 7, 7 x 7, 7 x 19); Ferrules and Thimbles; Serving and Locking Wires; Control Strand and Casing; Compressed Fittings for Attachments; Power and Lighting Cable; Welding Wire.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. *Branches in Principal Cities*

KEEPING PACE WITH AN INDUSTRY WHOSE WATCHWORD IS PROGRESS

There are 5 successive tests of

BALANCE

for SPERRY GYRO INSTRUMENTS

...1—Dynamic bal- Revolving at 14,000 ...the rotor is carefully ...ed and balanced, be- ...mbly in gimbal ring.

TEST NO. 2—Rotor and gimbal ring are checked for static balance. Suspended on knife-edges, they must balance perfectly in all positions.

TEST NO. 3—With vertical ring added to the rotor and gimbal ring, the unit again is carefully balanced on knife-edges before it is assembled.

TEST NO. 4—The completed Sperry instrument is carefully re-checked throughout—both as a unit and for each of its freely moving parts.

TEST NO. 5—Sperry inspection is not yet over! After "running in," the instrument once more is tested for accurate, dependable performance.

...Sperry instrument undergoes a long se- ...of tests for perfect balance. The methods ...have no superior for accuracy and ...pleteness. In balancing, as in all other ...s of instrument manufacture, Sperry has ...d no effort of *exact* workmanship that ...gs may be dependable and that pilots may ...absolute confidence in the indications of Sperry instruments. Without that confidence instrument flight would be impossible. *Sperry Gyroscope Company, Inc., Brooklyn, New York.*

SPERRY

EXACTNESS IN EVERY PROCESS OF MANUFACTURE

Leading American Planes Use **FORMICA PULLEYS** *for Dependable Control*

The controls of the great majority of American planes going into service are equipped with Formica control pulleys. These pulleys may be had with the best types of anti-friction bearings and are very carefully, accurately and thoroughly tested to meet the Army and Navy specifications.

Lightness, low thermal expansion and ability to maintain their original dimensions under diverse conditions are valuable qualities of these pulleys. Let us quote on your requirements.

The Formica Insulation Co., 4628 Spring Grove Ave., Cinn., O.

FORMICA

90% LESS "LOAD" ON THE PILOT

. . . *says* Louis Schwitzer, Sr.

LOUIS SCHWITZER, Sr. (*left*), *nationally known automotive engineer and president, Schwitzer-Cummins Co., of Indianapolis, manufacturers of Stokol Stokers, automotive and industrial equipment. Mr. Schwitzer and his son, Louis, Jr., own their third Waco and a Sikorsky amphibian.*

WACO 'N' SIMPLIFIES TAKE-OFF AND LANDING

"Flying safety has always been entirely too dependent upon the skill of the pilot. But now — the Waco 'N' assumes 90 per cent of the responsibility!" says Louis Schwitzer, who for fourteen years has done the majority of his business traveling in his own airplanes.

● The Waco 'N' is the *world's safest sedan-type airplane*—the first to provide comfortable, high-speed air travel—with the added safety of tricycle landing gear and automobile visibility.

It cruises at 150, then lands quickly from any altitude without a lot of time-wasting maneuvers—and *without the customary critical regard for speed, wind-direction or field size.* Its brakes may be applied as firmly as necessary at any time during landing or take-off—with no danger of nose-over. And regardless of cross-wind or uneven braking, ground-looping is impossible!

The 'N' accomodates four persons and six ordinary Gladstone bags. All Waco four and five place cabins are available on terms, through your local dealer.

WACO AIRPLANES
"ASK ANY PILOT"
WACO LEADS IN AIRCRAFT REGISTRATION

THE WACO AIRCRAFT CO. TROY, OHIO

SAFETY TO THE 'NTH DEGREE . . . LUXURIOUS COMFORT . . . OUTSTANDING PERFORMANCE

Here's your opportunity!

Audio - Power unit measures 10" x 6⅝" x 6⅝" — may be mounted anywhere convenient.

Radio - Frequency unit measures 7⅛" x 5" x 4¾". Small size permits instrument panel mounting.

Complete your present "1-way" radio —make it "2-way"!

Western Electric's 25A "Midget" transmits on any frequency from 2800 to 6400 kc. It covers private flyer and airline frequencies. It *weighs less than 25 lbs. complete.*

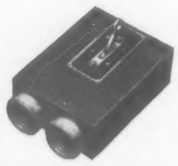
To flyers now having a receiver only, Western Electric offers the "2-way" you have always wanted. Built-in relay permits operation with any receiver.

The 25A is easily installed by your plane manufacturer or local aircraft service organization. For complete details: Western Electric Co., Dept. 318A, 195 Broadway, New York.

Popular Accessories

628A and 631B Microphones: specially designed to operate through high noise levels and give clear speech transmission.

1019A Anti-static Headset: standard on most of the nation's airlines. Reduces static clicks—delivers clear signals.



705A Switch: a positive emergency switch for cutting off all electrical power in plane. Thousands in use.

724A Filter: necessary for proper reception of Dept. of Commerce simultaneous beacon and weather transmitters with your receiver.

Western Electric

Northern Electric in Canada

TWO-WAY AVIATION RADIO TELEPHONE AND TELEGRAPH EQUIPMENT

The New KOLLSMAN ACCELEROMETER

Precision Aid to Inspection Routine

When the pilot reports that the trip was rough—or that he ran through a bad storm—or that his ship was thrown around a lot—do the maintenance men have to guess what wires were stretched or what fittings were loosened?

Not when the new Kollsman Accelerometer is part of the equipment. For this instrument records precisely, in *g* units, the exact maximum stress on the plane in its flight. The supervisor *knows* the *exact* amount of load applied—and knows, from previously determined standards, how to adjust the inspection routine.

The new Kollsman Accelerometer thus contributes an invaluable factor of safety in directing attention to needed checks and adjustments—and quickly repays its cost by cumulative time-saving in overhaul.

Thoroughly rugged, the new model Kollsman Accelerometer is a true service instrument. New in structure, and vastly improved over previous models, *it does not require locking for transportation.*

* * *

In addition to the transport type instrument shown in the photograph (which has a single recording hand), five other types of Kollsman Accelerometers are made especially for test purposes—some with both maximum and minimum recording hands.

Full specifications and more detailed information will be gladly supplied on request.

KOLLSMAN

PRECISION AIRCRAFT INSTRUMENTS

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WESTERN BRANCH, GRAND CENTRAL AIR TERMINAL, GLENDALE, CALIFORNIA

Aircraft cable GETS THIRD DEGREE

Bob Goodwin, Macwhyte Laboratory inspector, notes how "Hi-Fatigue" is standing the strain.
"This machine subjects cable to fatigue stresses similar to those encountered in flying," Bob says, "When cable passes this fatigue test—which of course meets all A-N specifications—we know it will give safe, dependable service."

● Days and weeks of laboratory experimenting, and countless hours of testing were necessary before Macwhyte engineers perfected "Hi-Fatigue" Aircraft Cable.

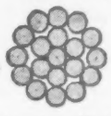
CABLE GIVEN TOUGH TESTS

This machine, as well as others in our laboratory, played an important part in making Macwhyte "Hi-Fatigue," a cable with the highest possible fatigue resisting properties. It was purposely built to be tough on cable! By the time "Hi-Fatigue" passes this, and other tests, it certainly deserves the official OK we give it.

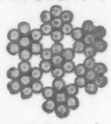
Leading aircraft manufacturers and airlines, too, have given Macwhyte Aircraft Cable their "OK." At a recent National Aircraft Show 3 out of 4 planes were equipped with Macwhyte Cables and Tie Rods—a fitting tribute to the quality and workmanship of Macwhyte methods of manufacture.

MACWHYTE AIRCRAFT CABLES

1 x 19 Non-Flexible



7 x 7 Flexible



7 x 19 Extra Flexible

Macwhyte Hi-Fatigue Aircraft Cable is available in both PREformed and non-preformed—tinned, galvanized or stainless steel.

MACWHYTE TIE RODS

Macwhyte Tie Rods like Macwhyte Aircraft Cables, conform to all A-N specifications.

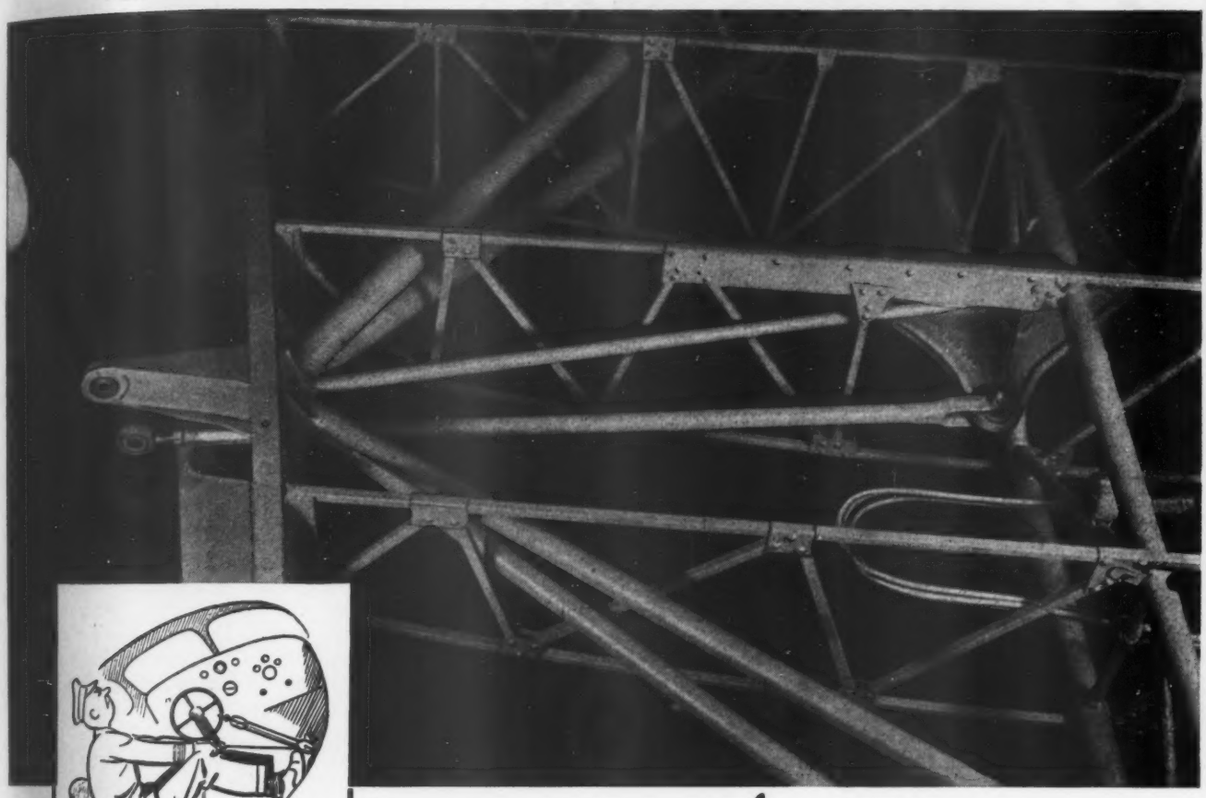
● Streamline
■ Square
● Round

MACWHYTE COMPANY
KENOSHA, WISCONSIN

Specialists in the Manufacture of Cable, Tie Rods and Braided Wire Rope Slings for aircraft

MACWHYTE *Hi-Fatigue* TRADE MARK AIRCRAFT CABLES

Typical Fafnir installation in an aileron hinge, push-pull link and bell-crank. Photo courtesy Stinson Aircraft Corp., showing Stinson "Reliant" Model SR9-FD.



DID YOU EVER fly a ship with "muscle-bound ailerons"? The kind that make you wish you had a block and tackle when you get a wing down? After a three-hour cross-country, you feel like you've been chopping a winter's wood supply. It's terrible!

Cured! "MUSCLE-BOUND AILERONS"

The muscle-bound wrestler has plenty of strength, but he can't use it — and that's the story with many aileron control systems. With plain bearings, you need only a dry one here and there, and one or two out of line — to make flying *hard work!*

Fafnir Ball Bearings throughout the aileron system remove these points of friction. You can almost "feel" the air-stream over the surfaces. The entire control is tight, without play, yet responsive to the slightest touch.

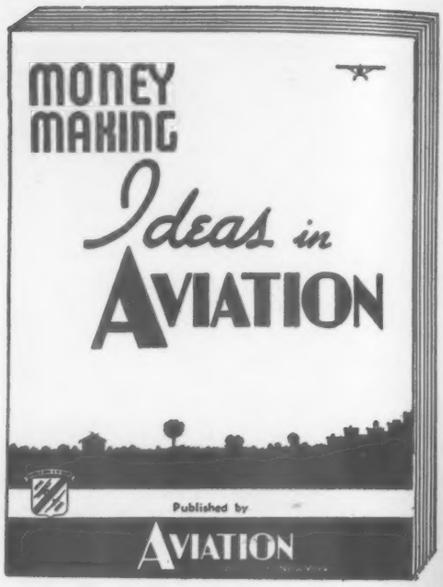
When you purchase an airplane, be sure the control system is Fafnir-equipped — on push-pull rods, bell cranks, pulleys and hinges. **These Fafnirs** *make flying easier.* The Fafnir Bearing Company, Aircraft Division, New Britain, Conn.

"The Aircraft Bearing Specialists"

FAFNIR BALL BEARINGS

THE BALANCED LINE—MOST COMPLETE IN AMERICA

Going Places In 1938? Then Let This FREE Book Help You



Newcomer or old timer—you will find practical, tested ideas in the pages of this book, specially compiled by the editors of AVIATION to meet the needs of Students, Pilots, Mechanics, Plane Owners, Fixed Base Operators, Transport and Airport Men. It is yours, without cost, with your subscription to AVIATION—the monthly issues of which bring you equally practical ideas for making your way in your chosen work.

While we call the book "Money Making Ideas" it's not a mere collection of ways in which to earn cash. It is filled with fresh, inspiring ideas that are self starters for live wire men. It's the kind of a book that encourages you to head for the top—by showing you how other men (many with such handicaps as no money, small town locations, etc.) have forged ahead and realized their aviation ambitions.

If you're just starting out—if you're experienced but feel you're in a groove—if you're impatient to get ahead *faster*—this book and the monthly issues of AVIATION can help you with these aims. Thousands of our readers who started with us as students are now important men in the world of flying. They claim that the all round coverage and information brought them by AVIATION has helped them to advance. This same material can help you. And the cream of much of it is contained in the pages of "Money Making Ideas" which comes to you free.

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Dollars from Photography—How to Buy a Plane on $20 a week income—Finding Jobs for Students—Ideas for Charter Service—Fixed Base Problems and Income—Instrument Training from Scratch—Flying Under the Hood—How An Airplane Opens the Door for the Salesman—The Low-Priced Airplane—Maintenance Kinks and Short Cuts—Trends in Sightseeing, Photography, Dusting—Aircraft at Work, as Told by users of Business Planes—and many other articles for everyone interested in the flying industry.

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Company .....

Position 6-38

This Offer Good Only in United States, Possessions and Canada.

Close-up section of longeron showing how the "step-taper" is located just ahead of welding station on fuselage assembly.

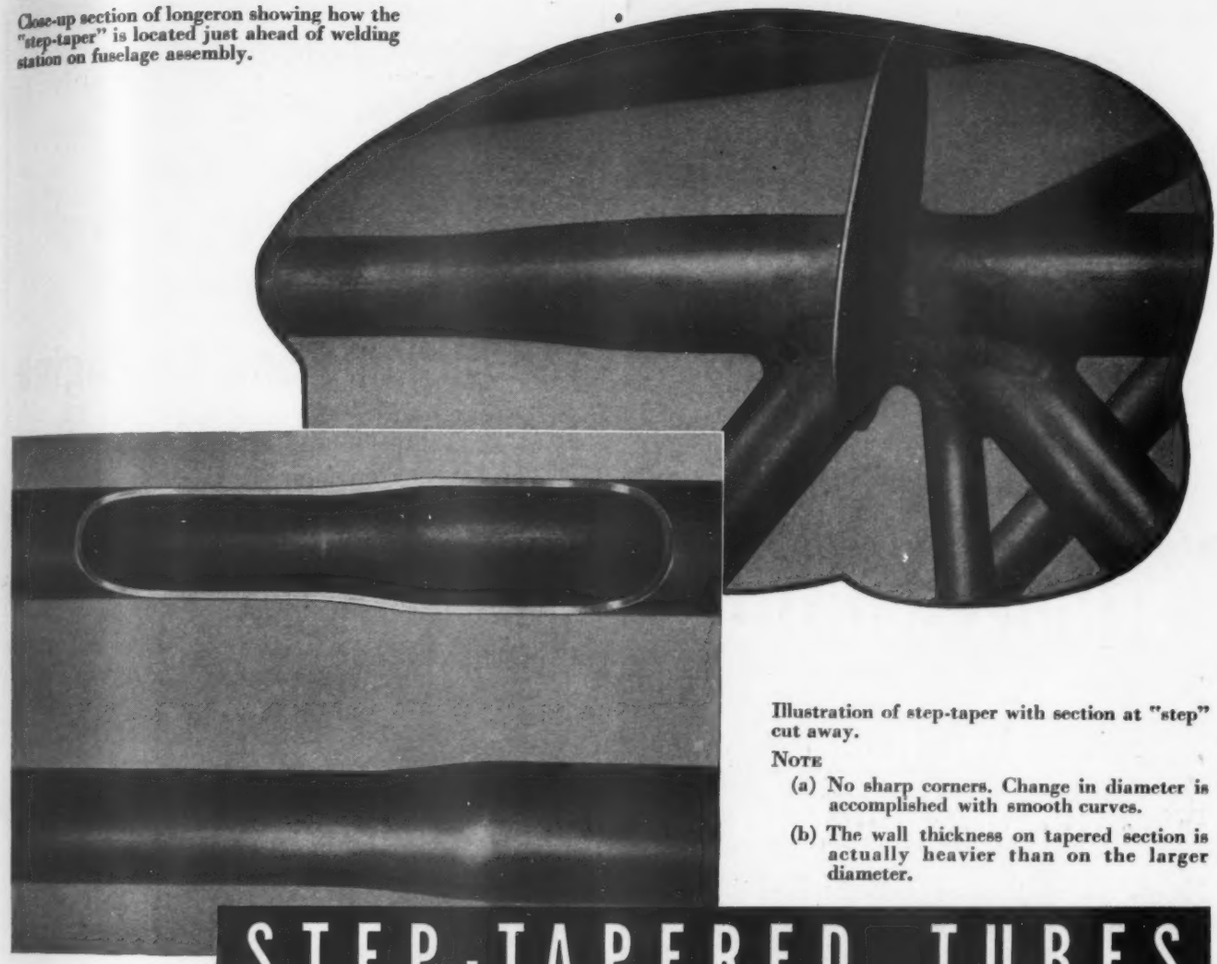

Illustration of step-taper with section at "step" cut away.

NOTE

(a) No sharp corners. Change in diameter is accomplished with smooth curves.

(b) The wall thickness on tapered section is actually heavier than on the larger diameter.

STEP-TAPERED TUBES

TAPERED tubes for structural parts in aircraft—longerons, wing spars, stabilizers—

Reduce weight by better distribution of the strength weight ratio.

Reduce labor costs by elimination of telescopic fits, fewer welds, and elimination of reinforcing sleeve.

Each tapered part becomes a continuous, homogeneous single tube. This reduces points for localizing stress.

Summerill is prepared to produce step-tapered tubes of 4130X aircraft quality in a wide range of sizes and lengths. We will be pleased to quote on receipt of detailed sketches.

SUMMERILL TUBING COMPANY

BRIDGEPORT, MONTGOMERY CO., PENNSYLVANIA

STANDARD SIZE AIRCRAFT STOCKS ARE AVAILABLE FOR PROMPT DELIVERY

BENDIX-SCINTILLA

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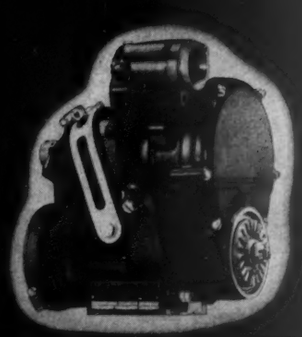

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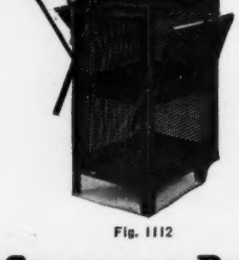

Fig. 1112

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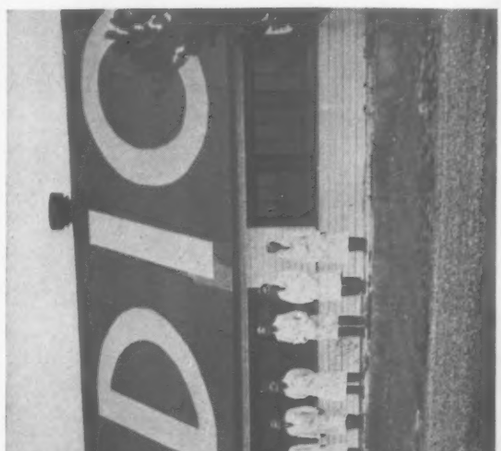

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Dear T.W.T. Keep up the good work. The Problems have my physics teacher on the run. I'm getting even for the last two tests he gave. —Paul Gooderum

"SAFEST" AWARDS TOP RECORD STORIES

There are some mighty fine stories buried in the recent announcement of awards of the National Safety Council.

These certificates of merit for "Outstanding Contributions to Safe Air Travel" went, among others, to the Eastern Air Lines and to the Pennsylvania Central Airlines.

Birthday

April 27th happened to be P.C.A.'s birthday. And on it they celebrated, not merely a single year without fatalities, *but 11 solid years, since they began to serve the public, without ever a single fatal accident to a passenger or a member of a crew!*

Extra credit was due to Eastern Air Lines, too, for this year's award to Eastern followed their previous year's record of topping all "bests" for that period.

A Matter of Pride

Gulf takes its hat off and bows all credit to these two companies. But we're prouder than punch that Pennsylvania Central Airlines has been using *Gulf Aviation Gasoline* exclusively, for many years—and that Eastern Air Line's record was made with both Gulf Gas and Gulf Airline Oil. (Since January, both are 100% Gulf Gas *and* Oil!)

Eddie Rickenbacker

In signing off we want to wish both lines the best of luck—especially to Capt. Eddie Rickenbacker and his associates who have just taken over Eastern Air Lines. —EDITOR

WHOPPER CLUB

The Whopper Club's diploma for the month goes to Charles E. Kerr, his whopper having been deemed most worthy of reproduction on this page. He takes issue with Dorothy Tibert's whopper, wherein "grandma" got rubbed with Gulf Aviation Gasoline instead of linament (she soloed about the house until she ended up in broken china, under the bed. Remember?)

"She'd have soloed on to heaven
Up among the stars so white . . ."

THIS MONTH'S WHOPPER

Ah! Miss Tibert, what a whopper
That you wrote at Aroostook,
Telling us of grandma's cropper
And her aeronautic fluke—
How she soloed to the ceiling
Through the room and round about,
How she sailed back to her boudoir
Absolutely cured of gout!

All because *Gulf Aviation*
You did rub on every joint . . .
Let me tell you, dear Miss Dotty,
That I think you missed a point!
Had her tanks been filled with *Gulf Gas*
As she flew on out the door,
She'd have shook her tail-skid at you
As you turned to see her soar!

She'd have made no chinese landing,
She'd had power to spare galore.
She'd have not received your panning
'Bout the china on the floor.
She'd have soloed on to heaven
Up among the stars so white,
And to shame she'd put the swallow
And the eagle in their flight!

As it was, she made a landing
On the floor, in broken glass—
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—C. E. Kerr, Richmond, Virginia

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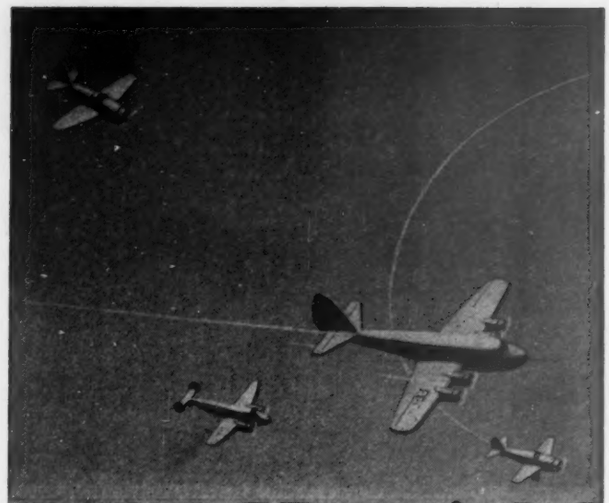

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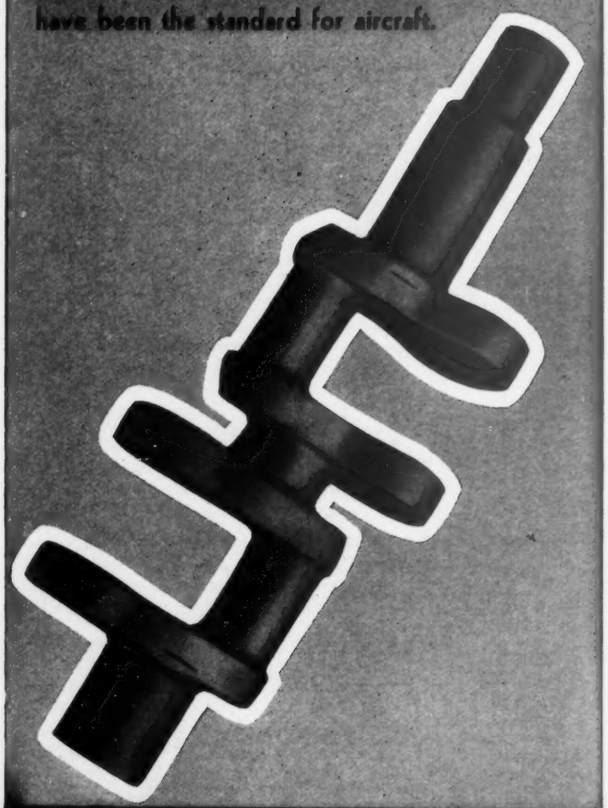

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STINSON 1936—Gull wing, 5 place, many extras, price on request. Waco, built October 1934, 210 Continental motor, just had first top overhaul, perfect condition, trades accepted. Meinke-Eldred Flying Service, Lost Nation Airport, Box 389, Willoughby, Ohio. No. 33

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CURTISS JR.—Salmson powered—licensed—both ship and engine just majored—Like new—$650.00. Savoia-Marchetti, amphibian 125 HP Kinner, engine just overhauled, plane in perfect condition, priced to sell. Meinke-Eldred Flying Service, Lost Nation Airport, Box 389 Willoughby, Ohio. No. 35

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WANTED—32 ft. Monocoupe Wing, Alvin Rushenberg, Kirkman, Iowa. No. 69

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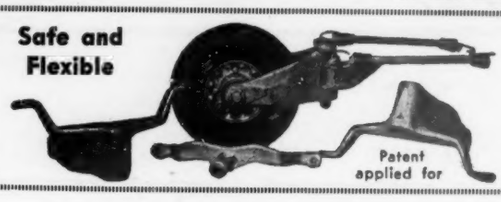

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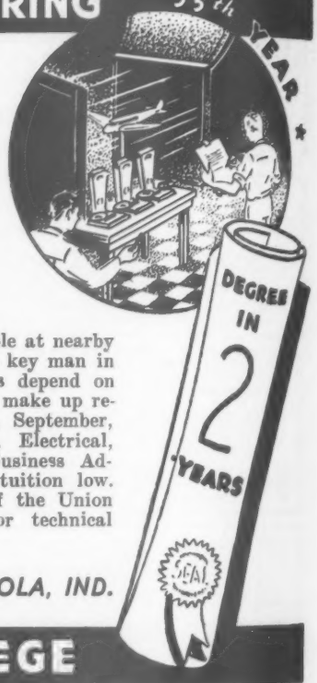

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17-P

New Consolidated Patrol Bombers Equipped with Goodrich DE-ICERS . . . Goodrich Tires and Brakes for Beaching Gear . . . and Other Goodrich Products

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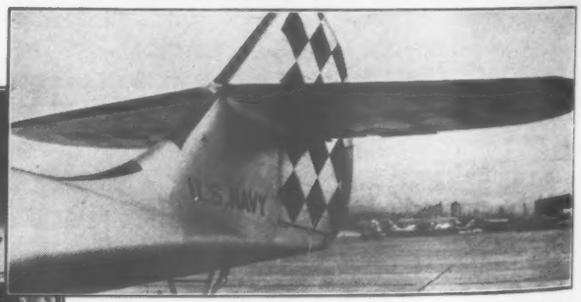

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